STUDY OF OUTCOME OF EARLY VERSUS DELAYED SURGERY IN LUMBAR DISC PROLAPSE- A PROSPECTIVE STUDY

Dissertation submitted to

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APRIL 2016

CERTIFICATE

This is to certify that this dissertation titled **"STUDY OF OUTCOME OF EARLY VERSUS DELAYED SURGERY IN LUMBAR DISC PROLAPSE-A PROSPECTIVE STUDY."** is a bonafide record of work done by DR. K.PUNEETH, during the period of his Post Graduate study from 2013 to 2016 under guidance and supervision of Prof.N.Deen Muhammad Ismail, Director i/c and Head of the department , Institute of Orthopaedics and Traumatology, Madras Medical College and Rajiv Gandhi Government General Hospital, Chennai- 600003, in partial fulfillment of the requirement of M.S ORTHOPAEDICS degree Examination of The Tamilnadu Dr. M.G.R Medical University to be held in April 2016.

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DECLARATION

I declare that the dissertation titled **"STUDY OF OUTCOME OF EARLY VERSUS DELAYED SURGERY IN LUMBAR DISC PROLAPSE-A PROSPECTIVE STUDY",** submitted by me for the degree of M.S. is the record work carried out by me during the period of August 2014 – August 2015 under the guidance of Prof. N.Deen Muhammad Ismail., Professor, Institute of Orthopaedics and Traumatology, Madras Medical College, Chennai. This dissertation is submitted to The Tamilnadu Dr.M.G.R. Medical University, Chennai, in partial fulfillment of the University regulations for the award of degree of M.S., Branch II (Orthopaedics) examination to be held in April 2016.

This work has not formed the basis for the award of any other degree or diploma to me previously from any other university.

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INTRODUCTION

Sciatica due to herniation of nucleus pulposus of intervertebral disc is one of the commonest symptoms of patients seeking consultation in day to day clinical practice. The annual incidence is 1 to 5%[1-3].The natural course of lumbar disc disease is usually favourable. It clinically affects only 1-2 % of people though prevalence in MRI reaches 30%[4].

Nonoperative management leads to resolution of symptoms in 70% of affected patients[5]. On the other hand failure of conservative management may result in surgery in 10% of patients[6]. There is no doubt with respect to decision of immediate surgery in absolute indications like progressive neurological deficit and cauda equina syndrome[6-8]. The doubt arises in those who are refractory to conservative management and pain that adversely affects quality of life[28]. Though surgery is commonly done for this indication, there is no consensus when to stop the conservative treatment and proceed with the surgery. Though non operative treatment is considered for few weeks due to self-limited course of lumbar disc herniation, the upper limit of this golden time is not defined. Moreover shared decision making that involves the

patients desire to proceed with surgery or avoid it, always raises the question whether outcome will be compromised if surgery is delayed and what is the critical time period in which surgery should be performed. Numerous studies have attempted to address this issue and the results are conflicting[9-27]. The aim of our study is to determine whether pre-operative duration of sciatica has any effect on surgical outcome(discectomy) by comparing variables in JOABPEQ and to tell near precisely when to stop conservative management and give an option of surgery to the patients with sciatica .

The JOABPEQ consists of 25 questions based on Roland Morris disability questionnaires and Short form 36 (sf 36). Scores are calculated according to answers given to questions on low back pain , lumbar spine dysfunction, gait disturbance, social life disturbance and mental health. Each subscale is scored to 0-100 points, with 100 being the best outcome[29]. We have used this new scoring system in our study to assess clinical outcome.

OBJECTIVES

1) To analyze the predictive value of the duration of preoperative sciatica on the functional outcome after lumbar discectomy using JOABPEQ.

2) To conclude ideal timing for surgery.

3) To study post-operative complications of lumbar discectomy.

4) To determine whether type of disc herniation has any effect on outcome of surgery with respect to duration of sciatica.

5) To conclude whether early surgery has a better outcome or not.

REVIEW OF LITERATURE

Studies related to duration of sciatica and discectomy have been published, dating from 1983-2014. Here is the detailed review of literature.

Weber et al (1983) conducted a randomized controlled trial and concluded that the long term outcome of conservative treatment vs. surgery are similar in patients with lumbar disc herniation. He also mentioned that duration of sciatica makes no difference to the outcome. However, since he has compared groups of patients having different duration of sciatica with the outcome in each group and multivariate analysis was not done, interaction among the variables have been discarded. Furthermore, randomization does not apply to the conclusions done for the duration of sciatica[27].

Hurme et al(1987) conducted a prospective study of 357 patients with lumbar disc herniation and using regression analysis found that long duration of preoperative sciatica (>2 months) was associated with poor outcome[15].

In a retrospective study of 150 patients by Barrios et al, the study concluded that there is no significant correlation between duration of symptoms and outcome of surgery[9].

Johnson et al (1993) conducted a prospective study of 120 patients undergoing discectomy and found that prolonged duration of symptoms was associated with poor outcome. But his study did not mention the time limit[16].

Nygaard et al (1994) conducted a prospective study of 132 patients and found that leg pain of more than 8 months duration increased the risk of poor clinical results[20].

In a multicentric prospective study of 381 patients by Junge et al (1995) concluded that duration of sciatica did not have any significant effect on the outcome of surgery[17].

In a prospective study of 374 patients by Quigley et al concluded that length of symptoms more than 6months affect the surgical outcome, but the study was of short duration(6 months)[23].

In a prospective study of 219 patients by Rothoerl , conservative care of up to 2 months for lumbar disc herniation was recommended[25].

In a retrospective study by Gaetani (2004), he came to a conclusion that age and type of disc herniation are most important factors to consider in deciding whether to operate or not and not the duration of symptoms[13]

In a prospective study of 113 patients by NG et al, it was concluded that duration of sciatica exceeding 12 months had a poor outcome ,but a precise duration for operation was not mentioned[19].

In randomized control study by Peul et al, it was concluded that 2 year outcome of conservative treatment versus surgery are similar in lumbar disc disease. The validity of this study is questionable as there is a 40% crossover rate in the conservative group [30].

In a prospective study by Fisher, it was found that the duration of time between symptom onset and surgery, inversely influenced health related quality of life[11].

In a prospective study by Silverplats ,they found that duration of leg pain less than 6 months had a better outcome in short and long term follow up[26].

In a retrospective study by Akagi in 2010, no difference in outcome was found with respect to duration of sciatica[31].

In a recent prospective study by Rihn(SPORT), it was concluded that patients with duration of symptoms less than 6 months had a better outcome and vice versa .But, there were significant baseline differences between the two groups like the type of herniation, presence of neurological deficit ,operative time, percentage of patients who reported depression and percentage of patients who had a preference for surgical treatment[24].

In a recent prospective randomized control trial and observational cohort study by Pearson et al, it was found that long duration of symptoms (>6months) was one of the factors associated with a greater treatment effect , suggesting that longer the duration of symptoms, a better outcome could be expected with surgery when compared to non-operative treatment[22].

I am summarizing average recommended trial of failed non-surgical management in Table 1

Table 1: Average recommended trial of failed non-surgical treatment

Research Investigation:	**Publication Year**	**Maximum time allowed for non-surgical treatment after which the chance of success for discectomy significantly reduces**
Postacchini F	1999	6months
Dvorak J, et al.	1988	4 months
Hurme M. & Alaranta	1987	2 Months
Rothoerl RD , et al.	2002	2 months
Ng LC, & Sell P.	2004	<12 months
Dauch WA , et al.	1994	6 weeks
Rihn	2012	6 months
Pearson	2010	6 months

No author has come to a definite conclusion regarding the upper limit recommended for stoppage of conservative treatment**.**

Most of the studies have Oswestry disability index, Roland disability questionnaire, visual analogue score, and prolo scale as outcome measures. Only one study by Akagi et al has used JOABPEQ as outcome measurement scale[28].

The validity of JOABPEQ has been already established[28].

RELEVANT ANATOMY

The human spinal column is an articulated segmental structure that serves dual purposes of protection and motion. The spinal columns functions include maintaining an upright posture, yet allowing for flexibility, while at the same time providing a conduit for neurological structures[29].

OSTEOLOGY: There are five lumbar vertebrae and sacrum making up the lumbosacral spine. The lumbar vertebrae are the largest vertebrae of the spine. A typical vertebra is composed of an anterior cancellous vertebral body and a posterior vertebral arch. The vertebral arch consists of a pair of cylindrical pedicles which form the sides of the arch, and a pair of flattened laminae which completes the arch posteriorly. The articular processes are vertically arranged and consist of two superior and two inferior processes. They arise from the junction of the lamina and the pedicle.

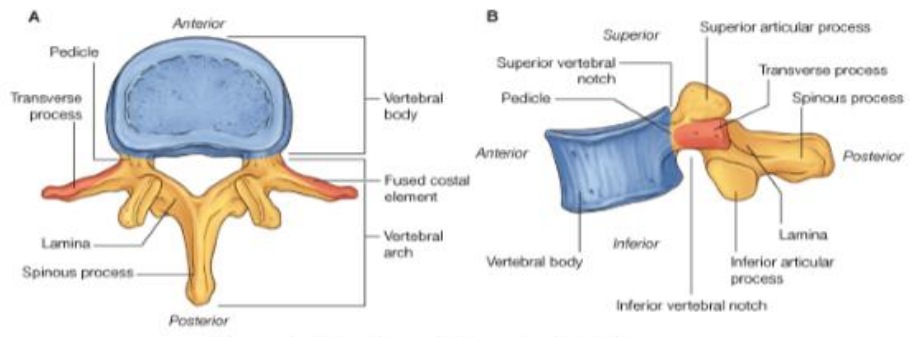


Figure :1 Osteology Of Lumbar Vertebrae

THE VERTEBRAL CANAL: The vertebral body, the pedicles and the vertebral arches enclose a triangular spinal canal. The walls and the floor consist of the pedicles and posterior vertebral body cortices respectively. Posterior annulus fibrosus and the posterior longitudinal ligament also contribute to the floor of the canal. The spinal cord with its coverings and the nerve roots form the contents of the canal[29].

INTERVERTEBRAL FORAMEN: The vertebral notches are located on the superior and inferior aspects of the pedicles of all vertebrae. The inferior vertebral notch is the most prominent and together with the superior vertebral notch of the vertebra below forms an intervertebral foramen, which are the exit points for the spinal nerves that leave the vertebra[29].

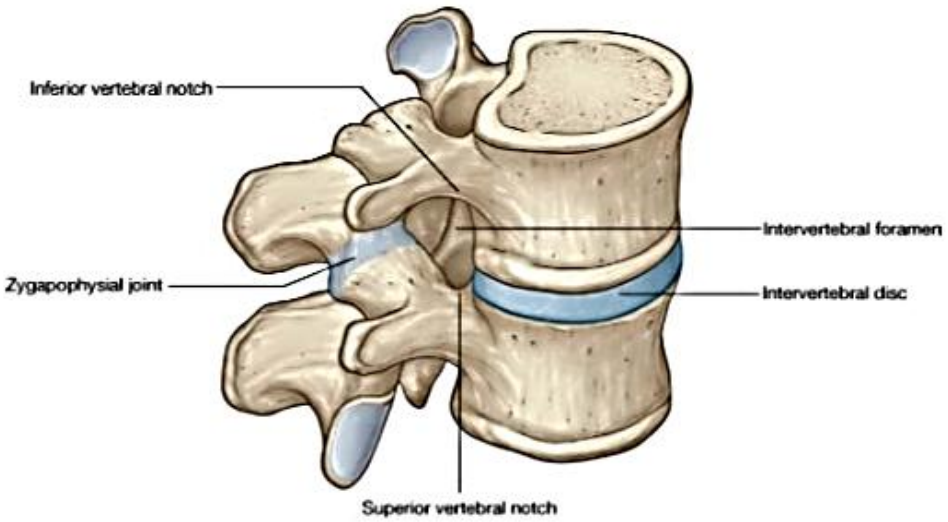


Figure 2: Joints In Lumbar Spine

THE INTERVERTEBRAL DISCS: Intervertebral disc is a discoid fibro-cartilage tissue, possessing elastic properties allowing absorbance and dispersion of loads on the spinal column and providing for smooth movement of the spine. The intervertebral discs make up approximately 25 percent of the total length of the vertebral column above the sacrum. In the lumbar region, the disc material makes up 33 percent of the length of the column. Each intervertebral disc consists of three components[49]:

- ❖ Nucleus pulposus
- ❖ Annulus fibrosus
- ❖ Cartilaginous end plates.

MOTION SEGMENT OF SPINE: The motion segment is the functional unit of the spinal column. The combination of both bony and soft tissue structures forms a motion segment, which is composed of two adjacent vertebral bodies, the facet joint created by their articular processes, the intervertebral disc between them and the associated soft tissue structures. The intervertebral disc and the facet joints (one on each side of the midline) allow for motion in flexion, extension, side bending and rotation at the level of the motion segment**.**

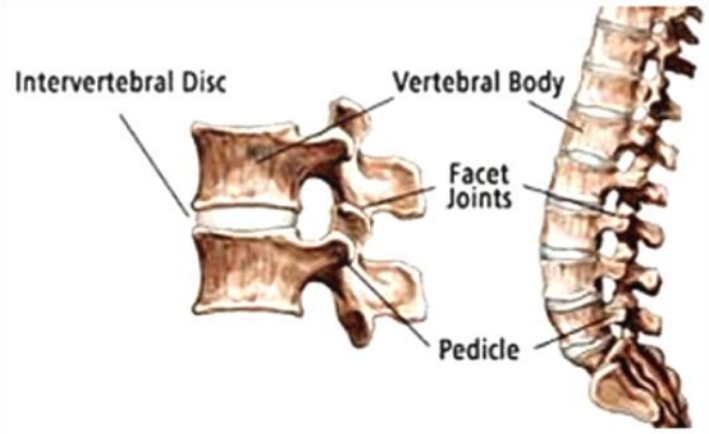


Figure 3: Spinal Motion Segment

Figure 4:Intervertebral Disc

Farfan H[30] has shown that lumbar disc herniation may be reflective of high stresses at the posterolateral region of the disc secondary to torsion. Also the posterior longitudinal ligament is very weak in the posterolateral aspect. These high loads and weakened posterior longitudinal ligament cause fatigue failure of the annulus fibrosus that enables the inner nucleus pulposus to penetrate the laminations of the annulus gradually until a herniation occurs. Because the region of the disc with the highest torsional stresses is adjacent to the nerve root, these posterolateral herniations nearly always affect the exiting root or the central thecal sac. Less commonly, the disc may protrude into the extraforaminal area and produce compromise of the more proximal exiting root.

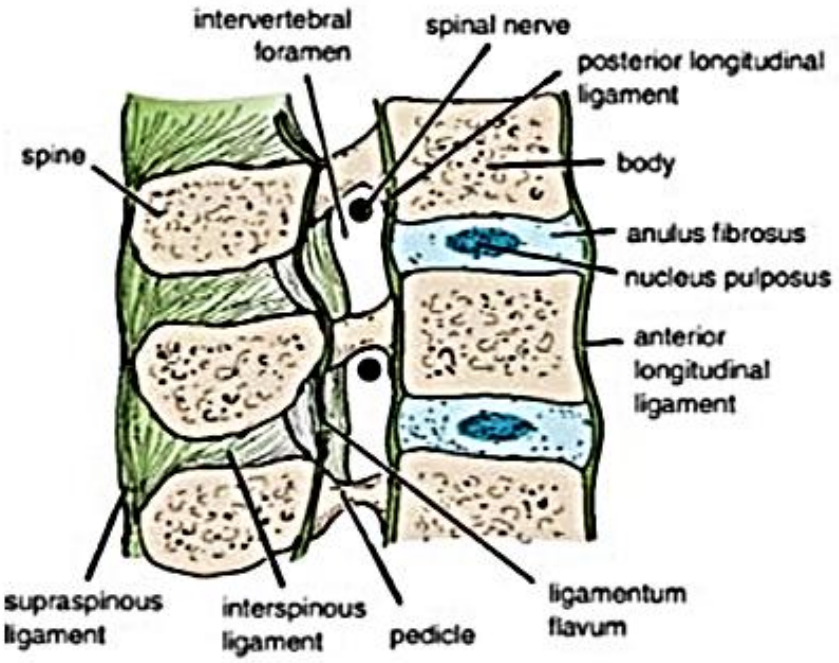


Figure 5: Cross Section Of Lumbo Sacral Spine

BLOOD SUPPLY: Paired lumbar arteries arise directly from the posterior aspect of the aorta, in front of the bodies of the lumbar vertebrae. During the adult phase of life, there is no active blood supply to the intervertebral discs. The vasculature of the nerve roots is formed by branches from the intermediate branch of the segmental artery distally and by branches from the vasa corona of the spinal cord proximally. The venous supply of the lumbar spine mirrors the arterial supply. The venous system is valveless, draining the internal and external venous system into the inferior vena cava[29] .

NERVE SUPPLY: The sinuvertebral nerve, arising from its corresponding spinal nerve, innervates the posterior longitudinal ligament, the superficial layer of the annulus fibrosus, the blood vessels of the epidural space, the anterior dura matter, the dural sleeve surrounding the spinal nerve roots and the posterior vertebral periosteum[29].

LIGAMENTS OF THE SPINE: The anterior and posterior longitudinal ligaments are on the anterior and posterior surfaces of the vertebral bodies and extend along most of the vertebral column. The anterior longitudinal ligament is attached superiorly to the base of the skull and extends inferiorly to attach to the anterior surface of the sacrum. Along its length it is attached to the vertebral bodies and intervertebral discs. The posterior longitudinal ligament is on the posterior surfaces of the vertebral bodies and lines the anterior surface of the vertebral canal. Like the anterior longitudinal ligament, it is attached along its length to the vertebral bodies and intervertebral discs .

The ligamentam flava, on each side, passes between the laminae of adjacent vertebrae. Each ligamentum flavum runs between the posterior surface of the lamina on the vertebra below to the anterior surface of the lamina of the vertebra above. The

ligamentam flava resist separation of the laminae in flexion and assist in extension back to the anatomic position[29].

Supraspinous ligament connects and passes along the tips of the vertebral spinous processes from seventh cervical vertebra to the sacrum. Interspinous ligaments passes between adjacent vertebral spinous processes. They attach from the base to the apex of each spinous process and blend with the supraspinous ligament posteriorly and the ligamentum flava anteriorly on each side.

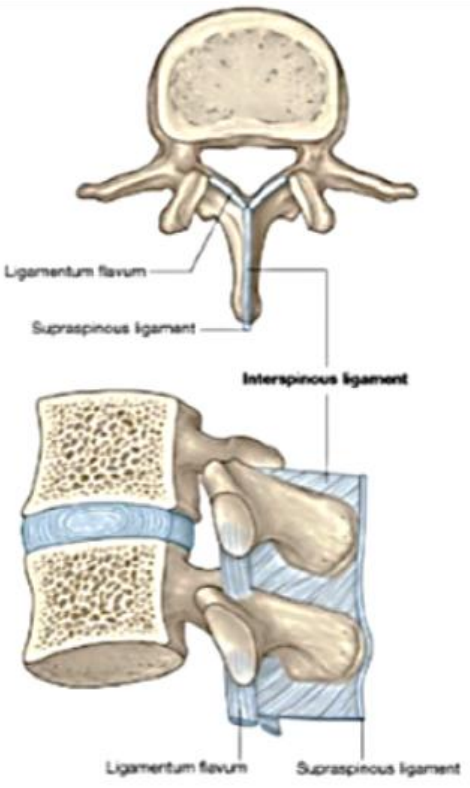


Figure 6: Posterior Elements Of Lumbosacral Spine

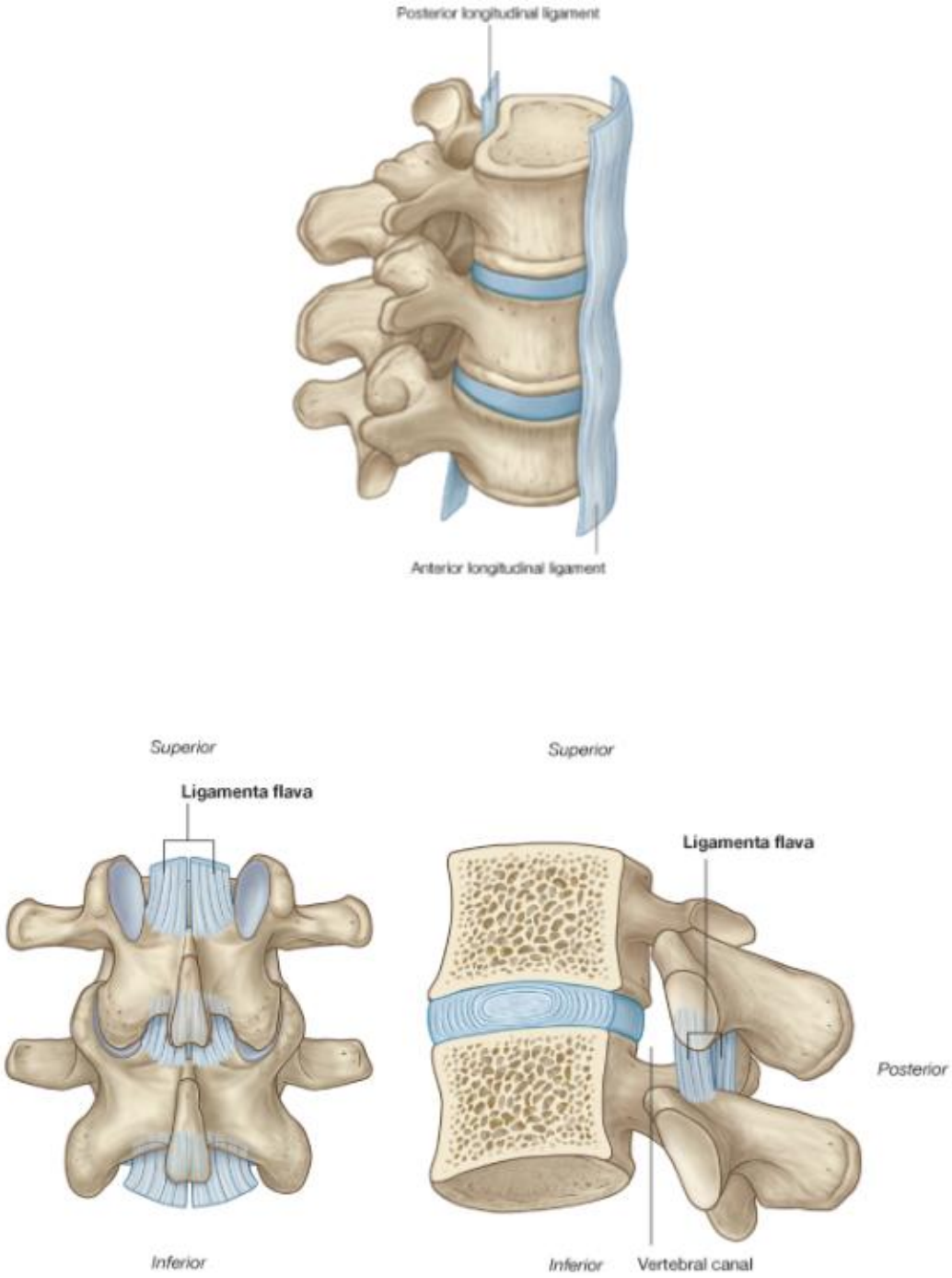


Figure 7:Ligaments Of Lumbo Sacral Spine

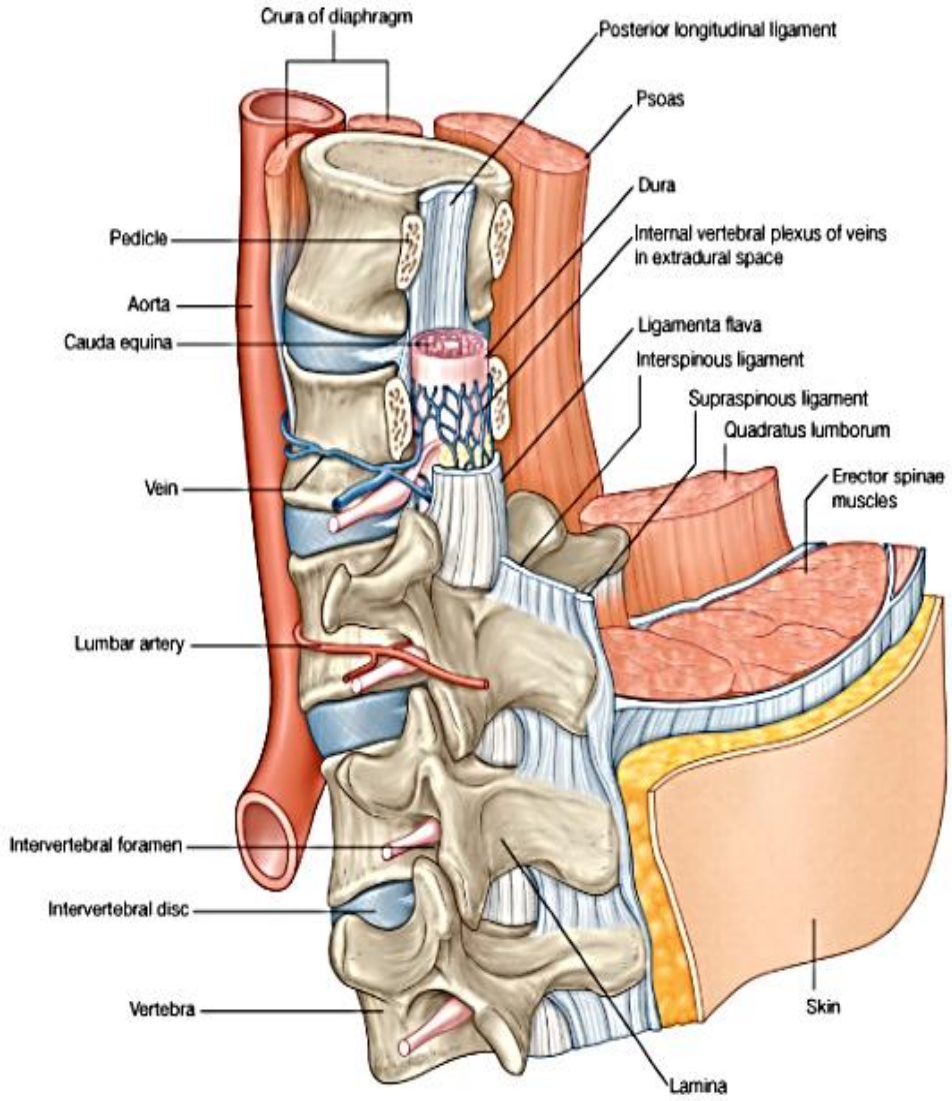


Figure 8: Layers From Skin To Spine

INTERVERTEBRAL DISC PROLAPSE

Hult L. [31] showed a linear increase in disc degeneration, to nearly 100 percent by the age of 59 years in workers performing heavy physical work. Kelsey and White[32] reported that the risk of being hospitalized for a herniated disc or sciatica was lowest in professional occupations and highest in manual workers and motor vehicle drivers.

PATHOPHYSIOLOGY OF INTERVERTEBRAL DISC PROLAPSE

Kirkaldy W[33] and associates delineated the natural aging process of the intervertebral discs from nuclear dehydration, through a series of inevitable changes.These degenerative changes may be accentuated in predisposed persons. With progressive degeneration, disc may herniate causing nerve root compression. According to Weber, disc herniation is a collective term to describe a process with rupture of annulus fibrosus and subsequent displacement of the central mass of the disc into the intervertebral space, common to the dorsal or dorsolateral aspect of the disc. A herniation occurs in a lumbar intervertebral disc when a separate tissue fragment extrudes or sequestrates, through a tear of the

annulus. Both a fissure and fragment appears to be required for prolapse to occur.

Holm[34] suggested that changes in disc dimensions during prolonged exercise as well as under prolonged external load appears to have a dramatic and permanent influence on the transport of nutrients into the disc further exaggerating disc herniation .

Mixter and Barr[35] propagated a mechanical understanding, where in the herniated disc compresses the root causing sciatica. The spinal nerves are relatively well protected from external trauma from surrounding structures. However, because they do not posses the same amount and organization of connective tissue sheaths as peripheral nerves, the spinal roots are particularly sensitive to direct mechanical trauma. Smith and Wright[36] showed the mechanical sensitivity of the affected nerves at the level of disc herniation.

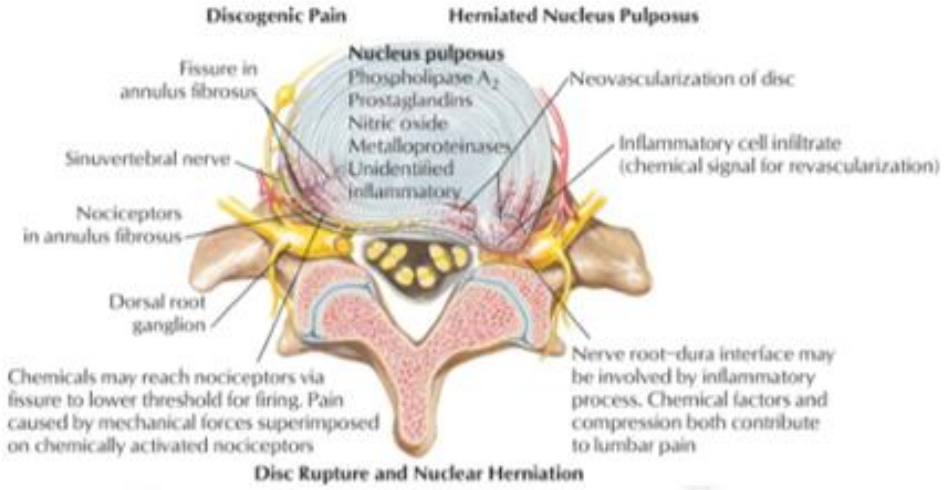


Figure 9: Pathogenesis Of Intervertebral Disc Prolapse

PATHOANATOMY OF INTERVERTEBRAL DISC PROLAPSE

Weber expressed that, disc herniation is a collective term, to describe a process with rupture of annulus fibrosus and subsequent displacement of the central mass of the disc into the intervertebral space, common to the dorsal or dorsolateral aspect of the disc. A herniation occurs in a lumbar intervertebral disc when a separate tissue fragment extrudes or sequestrates, through a tear of the annulus. Both a fissure and fragment appears to be required for prolapse to occur.

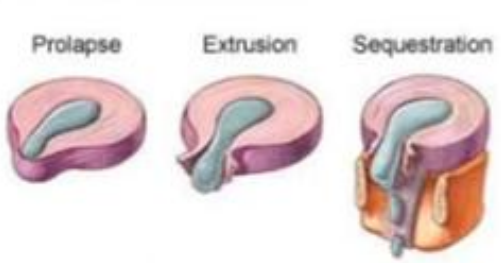


Figure 10: Degree of disc prolapse

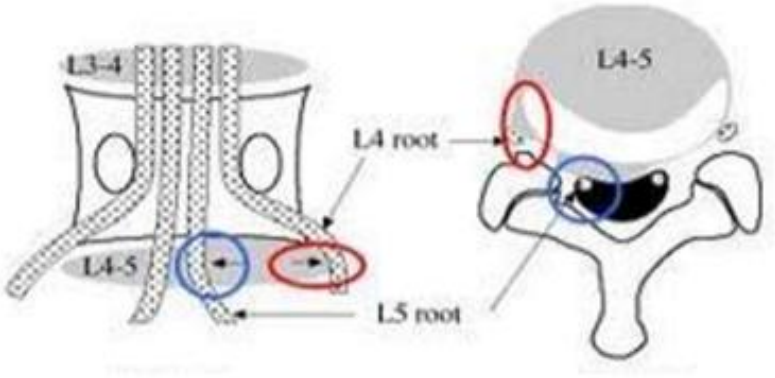


Figure 11 : Location of disc herniation:

In Figure 11 circular marker indicates the location of Para-median disc herniation and it results in compression of the nerve root exiting from the caudal vertebra, for example in a Para-median L4-L5 disc prolapse L5 nerve root is affected. The oval marker indicates far lateral disc herniation resulting in compression of the nerve root exiting from the same level for example in a far-lateral L4-L5 disc prolapse, L4 nerve root is affected. If the disc herniation is central it results in compression of cauda equina resulting in cauda equina syndrome.

CLINICAL FEATURES

PRESENTING COMPLAINTS

LOW BACK ACHE

Pain is the dominant and most disabling symptom, in patients who have sciatica due to a ruptured disc. Most patients with lumbar disc herniation have low back pain as the earliest symptom. The mechanical dull aching pain is made worse by standing, lifting and prolonged sitting, and is relieved by rest. The pain may last a few days and is characteristically intermittent in nature.

RADICULAR PAIN / SCIATICA

Pain, numbness and tingling in the involved leg, are the most common symptoms of a herniated disc. The patient often describes a sharp, shooting/ lancinating pain, usually starting at the posterior aspect of the hip or proximal portion of thigh and ultimately has a radicular distribution, corresponding to that of the nerve root involved. Pain increases on coughing, sneezing and ambulation.

SENSORY SYMPTOMS

The sensory symptoms appear with far more frequency than the motor symptoms. The most common symptom, following nerve irritation, is pain, in the form of paraesthesia, hyperesthesia.

MOTOR SYMPTOMS

During the initial stage of sciatica, patients are most concerned about sensory dysfunction and may not even notice motor deficits. Infrequently, the patient may present with lower extremity weakness which may be disabling. This is more likely to occur in disc lesions involving the fourth and fifth lumbar spinal nerve roots.

PHYSICAL EXAMINATION

O'Connell classified the signs, in lumbar disc herniation as the spinal signs, nerve tension signs and neurological signs[37].

SPINAL SIGNS

Loss of normal lumbar lordosis and paravertebral spasm are usually seen during the acute phase of disease. Occasionally in less acute situation the protective muscle spasm may be elicited only when the patient is stressed by prolonged standing or by forward flexion of the spine[37].

In acute disc prolapse the patient usually will have a list of the spine which has been termed as sciatic scoliosis. When the disc is herniated lateral to the nerve root, the patient will list away from the side of the irritated nerve in an attempt to draw the nerve root away from the disc fragments. When the herniation is medial to the

nerve. root, the patient may list towards the side of the lesion in an effort to decompress the nerve root. Limitation of spine motion is usually noted during the symptomatic phase of lumbar disc disease, particularly prominent in the sagittal plane than in the frontal plane. Palpation of the patient either in erect or prone position, may evoke tenderness in the midline, at the level of the disc lesion and in Para vertebral areas on the side of a nuclear extrusion.

NERVE TENSION SIGNS[30]

Nerve irritation may be elicited by methods which increase the tension on the nerve root.

THE STRAIGHT LEG RAISING TEST

The passive straight leg raising test is the most commonly employed one. With the straight leg raising manoeuvre, the L5 and S1 nerve roots, move 2 to 6mm at the level of the foramina. In an analysis of the diagnosis of the straight leg raising test , it was noted that tension is realized within the nerve roots contributing to the sciatic nerve, at 35 to 70 degrees of elevation from the supine position. This test is performed with the patient supine and head flat or on a low pillow. Only when leg pain or reproduction of the patient's radicular pain occurs, the test is considered positive.

WELL LEG RAISING TEST

Patient lying supine, the unaffected limb is flexed at hip with knee in full extension. If patient develops pain along the sciatic nerve distribution on the affected side, it is highly suggestive of disc prolapse compressing the exiting nerve root.

BOW STRING TEST

Patient is asked to flex the hip with knee in full extension , on the affected side till the pain is felt. At this point the knee is flexed, which instantaneously reduces the pain. On pressing the sciatic nerve in the popliteal fossa the painful radicular symptoms restarts which indicates tension on the nerve roots.

SCIATIC NERVE STRETCH TEST

Patient is asked to lie supine and the foot is supported and gradually flexed at hip with knee in full extension, during this maneuver patient develops pain. When patient develops pain flexion at hip is stopped pressure is applied over the anterior aspect of ipsilateral knee in order to extend the knee. If there is sharp radicular pain it indicates tension on the nerve root.

NEUROLOGIC SIGNS[30]

A meticulous neurological examination often, but not always, yields objective evidence of nerve root compression. It suggests

the level of disc herniation but is not conclusive in this regard. The involved nerve root usually is not completely involved and the neurologic findings may vary. There may be no objective neurologic findings because the involved nerve often remains functional. Loss of Deep tendon reflex, motor weakness, muscle atrophy or sensory loss will be more suggestive of root compression. The neurological findings in the lumbosacral nerve root lesions are compiled in the following Table.

TABLE 2:

Clinical Root Syndrome	**Sensory Findings**	**Motor Findings**	**Deep tendon Reflex**
L4	Numbness over the anteromedial thigh and knee	Weakness and Atrophy of quadriceps.	Knee jerk absent.
L5	Numbness over lateral leg, web of great toe.	Weakness of dorsiflexion of great toe and foot.	Usually none.
S1	Numbness over back of calf, lateral heel, foot and toe.	Weakness of plantar flexion of foot and great toe may be affected.	Ankle jerk diminished or absent.

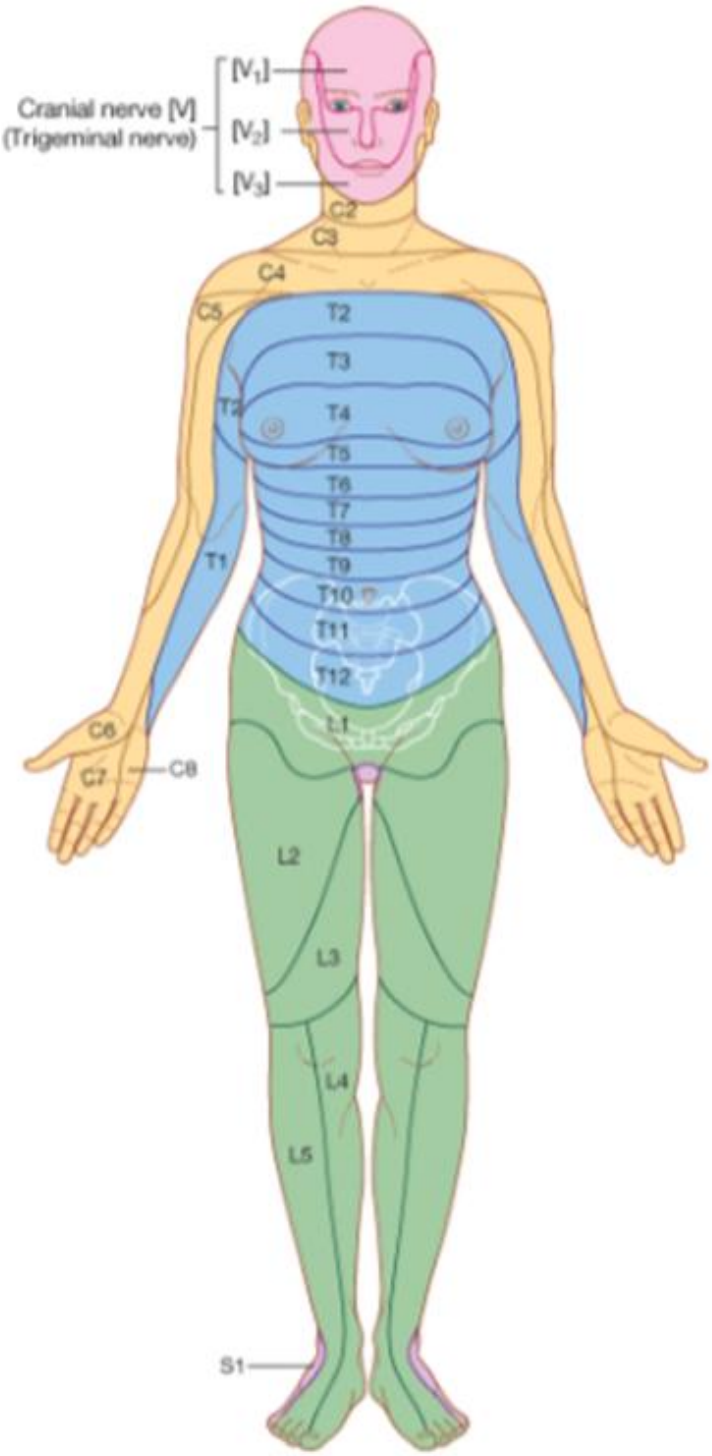


Figure12: Dermatomal Pattern

INVESTIGATIONS

X RAY LUMBO SACRAL SPINE

The first line of investigations includes X-rays of lumbosacral spine in both anteroposterior and lateral views. There may be loss of lumbar lordosis with scoliosis depending on the location of disc prolapse and uniform reduction of disc space. In acute IVDP there may not be significant reduction in intervertebral disc space. Oblique views and flexion extension views should be taken to rule out instability of spine .

MYELOGRAPHY

In the past, the gold standard in the diagnosis of disc herniation had been the Myelogram. Bell and associates [39] reported the largest series comparing Computed Tomography with Metrizamide Myelography in the diagnosis of surgically proven herniated discs and spinal stenosis. Albeck and associates [40] in a controlled comparison of Myelography, CT and MRI in clinically suspected lumbar disc herniation indicated that CT or MRI should be the first choice of imaging in patients with suspected lumbar disc herniation.

COMPUTED TOMOGRAPHY (CT):

Major advantages of computed tomography over myelography are their ability to visualize the pathology, non-invasiveness and less radiation exposure for patients and radiologists. The importance of correlating, findings in the various imaging modalities with clinical symptoms has been emphasized in several studies. Wiesel and associates[41] performed lumbar CT Scans in 52 asymptomatic subjects. The overall incidence of CT abnormalities was 37% and was more common in persons over 40 years of age.

MAGNETIC RESONANCE IMAGING (MRI)

Magnetic Resonance Imaging offers increased soft tissue resolution and allow for evaluation of lateral recess pathology, in addition to visualizing the thoraco lumbar region for possible spinal tumours. Modic M.T[42] and co-workers in 1986 investigated the accuracy of MRI, Myelogram and CT in lumbar disc disease. Their studies showed that MRI was more accurate than Myelogram (82.3% vs. 71.4%) and was equal to CT (82.3% vs. 83%) in diagnosis of disc herniation. They concluded that the combination of MRI and CT was equal in diagnostic accuracy to the combination of CT and Myelogram (92.5% vs. 89.4%). However, because MRI is non-invasive without any radiation hazard and has

increased soft tissue delineation its advantage to the patient as well as the operating surgeon is obvious .

Boden and colleagues[43] performed lumbosacral MRI scans on 67 asymptomatic subjects. They reported findings suggestive of compressive pathology in approximately one third of the subjects studied. These reports emphasize the need for correlation of neuroradiologic findings with clinical symptoms and signs and this is the first step in avoiding surgical complication and failed back surgery syndromes.

Figure 13 A: (Case no: 19) Showing T2 axial L5-S1 Right Para median herniation compressing Right S1 nerve root

Figure 13 B: (Case no: 19) Showing T2 sagittal L5-S1 herniation

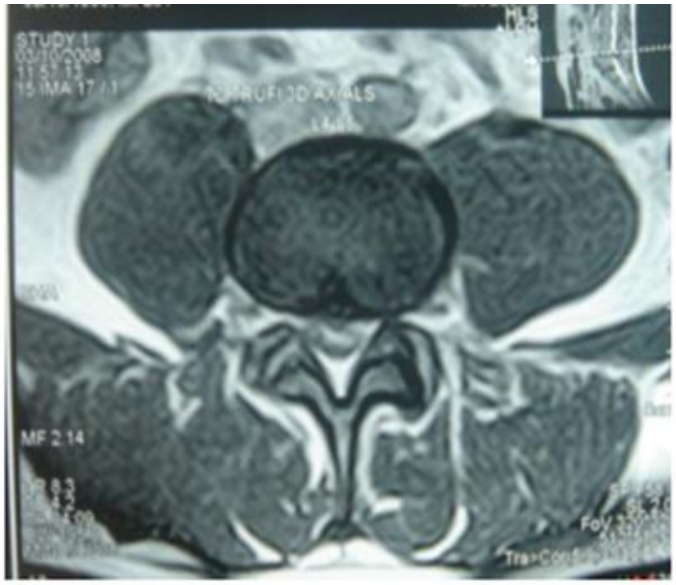


Figure 14 A : (Case no: 13) Showing T2 axial L4 -L5 left Para median protrusion compressing left L5 nerve root

Figure 14 B : (Case no: 13) Showing T2 sagittal L4-L5 protrusion indenting on thecal sac

MANAGEMENT

The principle of management is to remove the offending agent, the herniated disc which is compressing the nerve root. The protruded disc lesion can be resorbed by macrophages,granulocytes and lymphocytes [50]. and the defect in the annulus fibrosus, repaired by fibrous tissue formation[27]. The various options available for the management of Lumbar disc prolapse are broadly non operative and operative. Conservative treatment with rest, medications and physiotherapy , epidural steroid infiltrations are the non-operative treatment available. Among the operative methods there are various techniques described which includes chemonucleolysis, standard laminectomy, discectomy, microscopic discectomy, spinal fusion and total disc replacement.

I.CONSERVATIVE TREATMENT

Patients with lumbar disc herniation, most of the times are benefited from conservative treatment. Patients with a definite diagnosis of ruptured lumbar intervertebral disc and sciatica, with neurological signs and symptoms should be carefully observed and can be treated by non-surgical means for a period of 4-8 weeks, unless there is progressive loss of motor, sensory bladder or bowel

function before the diagnosis. Weber, Holme and Amlie [46] reported that 70% of patients with sciatica had a considerable reduction in pain within four weeks. The conservative treatment of lumbar disc herniation consists of bed rest and traction, medications, physiotherapy.

A. BED REST AND TRACTION

The simplest treatment for acute back pain is rest. Pain relief is usually experienced by a patient confined to bed. The optimal position is supine with knees and hips flexed. For radicular pain, one week is probably the shortest recommended time, and 2 weeks, the longest.

B. MEDICATIONS

Drug therapy may be directed to reduce nerve root inflammation, pain and for muscle relaxation. The sciatic pain is due to a perineural inflammatory response to the herniated disc material. In many instances, this inflammatory change can be decreased by anti-inflammatory drugs. Bed rest remains the best way to treat muscle spasm. Anti-depressant drugs are not indicated in acute attacks, but they may reduce the need for analgesics in patients with chronic pain.

C.PHYSIOTHERAPY

Several physical agents are used for the therapeutic management of low back pain, out of these the most important are Short Wave Diathermy(SWD), Interferential Therapy (IFT) ,and Transcutaneous Electric Nerve Stimulation (TENS) .

SWD are high frequency currents commonly used at 27.12 MHz and sets up a radio length of 11.6 metres. It generates deep heat without any discomfort and increases local blood flow, thereby washes away the metabolic end products and brings about resolution of inflammation.

IFT is a method of producing low frequency alternating currents around 4000 Hertz to evoke currents between 1 and 100 Hertz, selectively at any tissue depth. Direct stimulation by interference current produces inhibition of sympathetic system resulting in vasodilatation and helps in removal of pain metabolites and exudates if present. It also reduces pain based on gate theory of Melzack and Wall.

TENS is the application of pulsed rectangular wave current forms through surface electrodes on the skin. It works on the principle of the pain gate theory and achieves pain relief by

stimulating large afferent fibres preferentially, thus inhibiting transmission of pain impulses.

II. EPIDURAL STEROID INFILTRATION

The epidural injection of a combination of a long acting steroid with an epidural anaesthetic is directed to reduce the inflammatory component of disc herniation. 60-70 percent of satisfactory results have been described. Low pressure headaches, sciatic pain reproduced during injection and a transitory motor weakness lasting 15-20 minutes are some of the associated complications.

III. SURGICAL MANAGEMENT

When conservative treatment for lumbar disc herniation fails, the next consideration is surgical treatment and the options are as follows.

1) Chemonucleolysis
2) Standard laminectomy and Fenestration discectomy
3) Microscope assisted lumbar discectomy
4) Percutaneous Discectomy
5) Discectomy and Spinal Fusion
6) Total Disc Replacement

CHEMONUCLEOLYSIS

Injection of chymopapain into the disc will result in dissolution of the mucopolyssacharides of the disc and reduce the intradiscal pressure and often effect complete relief of pain. Due to its potential hazards until recently its use was restricted.

STANDARD LAMINECTOMY AND FENESTRATION DISCECTOMY

Open surgery for lumbar disc herniation, still is and will continue to be the most frequent and most relevant options of various spine surgeries. The rate of successful outcome of lumbar disc surgery varies considerably from less than 70 percent to more than 90 percent. Under general anaesthesia the patient is positioned in a modified kneeling position (in this position abdomen hangs free, minimizing epidural bleeding; preferred approach). A mid line skin incision is made centering over the spinous process as per the preoperative location of the level, soft tissues are elevated subperiosteally from the spinous process and lamina. A window is made by incising the ligamentum flavum and nibbling the inferior margin of the lamina if it is difficult to release the ligamentum flavum. The dura and the nerve root are retracted to identify the disc pathology. The disc is removed extradurally. Haemostasis is achieved and the wound is closed in layers.

SURGICAL TECHNIQUE USED

- The patient is anaesthetized and positioned prone over Halld frame. By allowing the abdomen to hang free, intravenous pressure is decreased and blood loss is reduced as a result of collapse of the epidural venous plexus.
- The disc level is identified with Image Intensifier Television (C-arm) and marked with skin pencil.
- The lower back is prepared and draped in sterile fashion.
- Infiltration of the skin and subcutaneous tissue with 1: 500,000 epinephrine solution done to aid hemostasis.
- Midline skin incision centering over the involved lumbar segment is made.
- Dissection is carried down in the midline through the skin, subcutaneous tissue and lumbodorsal fascia to the tips of the spinous processes.
- Identify the spinous processes of respective level of discectomy, and use the cautery unit to incise the fascia directly over the spinous processes.

- Self retaining retractors are used to maintain tension on soft tissues during exposure.

- Subperiosteally, the Para spinal muscles elevated on either side of the appropriate spinous process using cobbs elevator and cautery unit i.e.; L4 lamina in L4-5 disc and L5 lamina in L5-S1 disc..

- Each segment is packed with a taped sponge immediately after exposure to lessen bleeding.

- At this stage before fenestration of ligamentum flavum the level is rechecked and confirmed with Image Intensifier Television (C-arm).

- The supraspinous and interspinous ligament of the appropriate vertebra cut and the spinous process excised using an angled bone cutter.

- At this stage ligamentum flavum is clearly exposed and incised with a bayonet – pointed knife.

- During dissection of the ligament keep the point of the knife in view so that the dura will not be nicked.

- With an angulated Kerrison rongeur the remaining small shelving portion of ligmentum flavum is removed.

- The dura is retracted medially and nerve root is identified.

- Nerve root is retracted medially using a Love nerve root retractor so that the underlying extruded fragment or bulging posterior longitudinal ligament can be seen. Occasionally the nerve root adhesions to the fragment or to the underlying ligamentous structures and will require sharp dissection from these structures.

- Posterior longitudinal ligament is carefully palpated to seek a defect if no extruded fragment is seen. If no obvious abnormality is detected follow the root around the pedicle or outside the canal or in the root axilla to search fragments that have migrated inferiorly.

- If the disc cannot be teased from under the root, a cruciate incision is made in the disc laterally.

- The extruded loose fragments are removed using a pituitary forceps until the bulge has been decompressed to allow gentle retraction of the root over the defect. Slimy layer is preserved.

- The wound is closed with absorbable sutures in the supraspinous ligament and subcutaneous tissue.
- Skin is closed with nonabsorbable sutures.
- Sterile dressing is done.

POST-OPERATIVE REGIMEN

- Neurological function is closely monitored after surgery.
- The patient is allowed to turn in bed.
- Prophylactic Antibiotics and adequate analgesics given.
- Patient is allowed to sit up and walk using a lumbosacral orthosis.
- Gentle isotonic leg exercises are started immediately.
- Dressings are changed on post op day 2 and if the wound is healing satisfactorily then patient is discharged.
- The sutures are removed on 12th post-operative day.
- Gradually the duration of sitting and walking is increased to maximum by 6 weeks.
- Lifting, bending and stooping are prohibited for 3 months.

- Between the fourth and sixth post-operative week, back school is stressed.

- Lifting, bending and stooping are gradually restarted after 3 months.

- In our study labour intensive job started after three months with advice to modify their occupation activity.

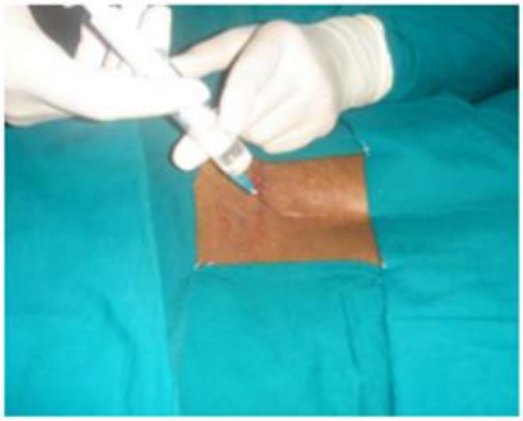


Figure 16: Infiltration of skin and subcutaneous tissue with a 1: 500,000 epinephrine solution to aid haemostasis.

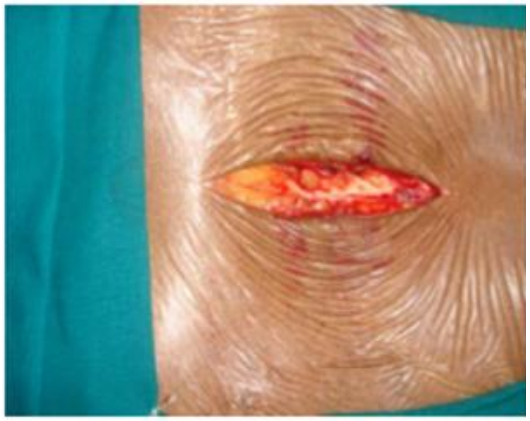


Figure17: Midline skin incision centered over the involved lumbar segment·

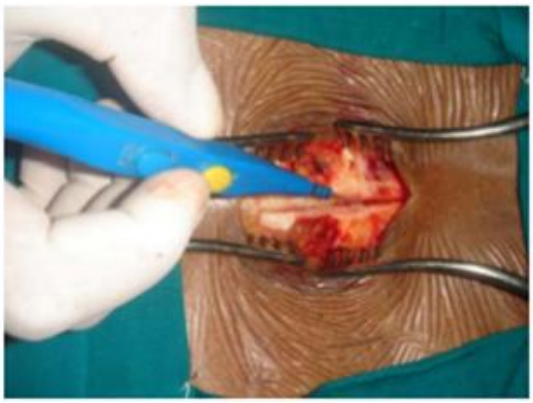


Figure 18: Dissection is carried down in the midline through the subcutaneous tissues, lumbodorsal facia to the tips of the spinous process.

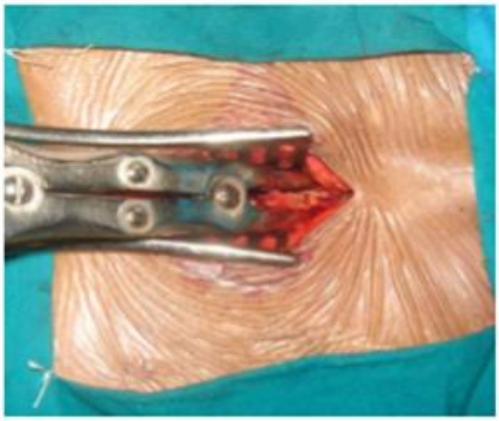


Figure 19:Wound edges are retracted using self retaining retractors and respective spinous process excised.

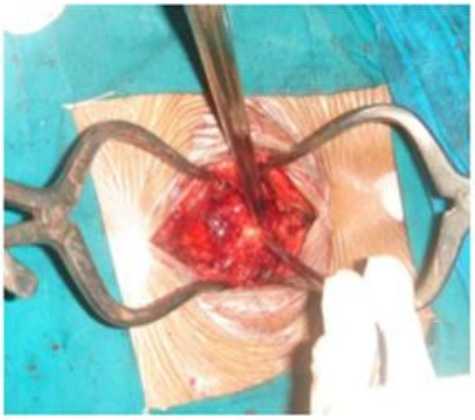


Figure 20: Laminae are excised using an angulated Kerrison rongeur.

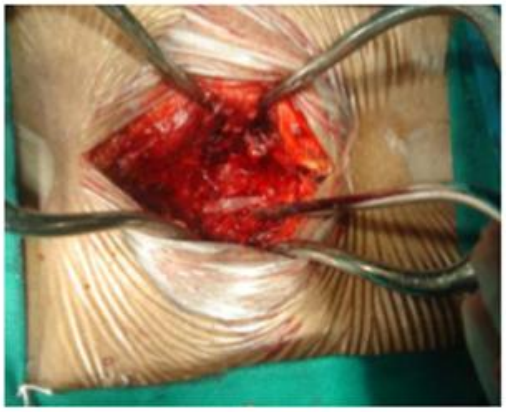


Figure 21: Cord after removal of disc fragments. The bulge has been decompressed.

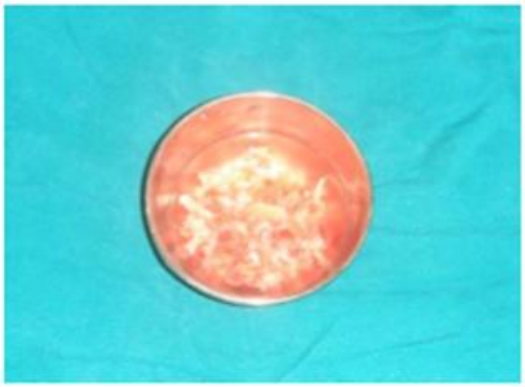


Figure 22: Excised disc

Figure 23: Angulated Kerrison rongeur and pituitary forceps·

Figure 24: Lamina spreader, Dural retractors, Nerve root retractor, curette, Bayonet pointed knife(from left to right)

MICRO LUMBAR DISC EXCISION: [47]

Micro lumbar disc excision has replaced the standard open laminectomy as the procedure of choice for herniated lumbar disc. This procedure can be done on an outpatient basis. It and allows better lighting, magnification, and angle of view with a much smaller exposure. Here a small incision is made and a laminotomy performed. With help of microscope the disc material is removed and tension on the nerve root is relieved.

PERCUTANEOUS DISCECTOMY: [47]

Percutaneous discectomy is done using Endoscopic techniques. This method has been developed with the purported advantage of shortened hospital stay and faster return to activity. These techniques generally are variations of the microdiscectomy technique using an endoscope and different types of retractors. The basic principles remain the same as with microdiscectomy.

DISCECTOMY AND INTERBODY FUSION:[47]

It was noted that patients undergoing discectomy developed chronic low back ache secondary to early onset of degenerative changes and instability in the corresponding motion segment of spine. Studies have proved that following discectomy if fusion is achieved it reduces the instability and early onset of degeneration in spine. There are multiple

options, including anterior lumbar interbody fusion techniques, postero lateral interbody fusion techniques, posterior interbody fusion techniques, and combined anterior and posterior fusion. There are a variety of stabilization alternatives involving interbody devices, pedicle screw fixation, cages and combinations of these strategies. The ultimate goal in each type of surgery is a solid arthrodesis. Also, the arthrodesis may use autologous iliac bone graft or bone morphogenetic proteins. But the long term results of spinal fusion for herniated disc were not pleasing due to early degeneration of adjacent motion segments of spine.

TOTAL DISC REPLACEMENT:[47]

A technique that has gathered great attention in the last 4 to 5 years is that of total disc replacement in terms of preserving the spine motion segment. Through anterior approach discectomy is done and the total disc replacement implant is secured to the endplates of the adjacent vertebrae. The essential prerequisite to perform total disc replacement is to have a normal facet joints at that level. The draw backs of total disc replacement are controversies regarding the motion segment preservation and there is no long term results about the outcome, wear and tear of implant, aseptic loosening and the strategy about revision surgery.

METHODOLOGY

SOURCE OF DATA

Sixty four patients with sciatica diagnosed to have single level Lumbar Intervertebral disc prolapse by Magnetic Resonance Imaging admitted at Rajiv Gandhi Govt. General Hospital during the study period Aug 2014 to Jan 2015 were included in the study.

METHOD OF COLLECTION OF DATA

All those patients who came with sciatica from Aug 2014 to Jan 2015 were evaluated clinically and analysed with Magnetic Resonance Imaging of the Lumbo-sacral spine to diagnose lumbar disc prolapse. Laboratory investigations were carried out in order to evaluate the fitness for surgery. These patients were divided into 3 sub cohorts depending on their duration of the sciatica. Patients with duration of sciatica < 4 months as Sub cohort A , 4-8 months as Sub cohort B, > 8 months as Sub cohort C. After obtaining consent, the patients underwent standard fenestration discectomy. All the patients were operated under general anaesthesia under all sterile precautions and second generation cephalosporins and Aminoglycosides were used for surgical prophylaxis. The post

operative regime for all the patients was followed as mentioned earlier. `

All the patients involved in the study underwent thorough clinical examination and the JOABPEQ questionnaire was used to assess the disability preoperatively and post operatively on 6th month and 1st year respectively and the absolute JOABPEQ score was calculated. The JOABPEQ questionnaire format and the method of calculating the absolute scores are clearly elaborated in annexure. We have taken in to consideration, preop scores and post op scores at 1 year. The difference of more than 20 is considered as satisfactory outcome. The difference between the scores of preop and post op at 1 year were tabulated and analysed by comparing the mean values in each subcohort and results were interpreted by SPSS syntax software Post-hoc test (Multiple Comparisons Bonferroni) and Spearman's rho Correlation Coefficient.

The JOABPEQ consists of five components:

1.Low back pain scores:These scores describe the severity of the low back pain.

2.Lumbar function scores: These scores describe how the movements of lumbar spine are affected due to pain like bending forwards ,backwards, standing up from the chair etc.

3.Walking ability: These scores describe the distance the patient can walk, ability to climb stairs .

4.Social life function:These scores describe how the normal routine activities of the indivisual are affected.

5.Mental health scores: They describe the psychiatric comorbidity.

INCLUSION CRITERIA

1) Patients with lumbar disc disease with documented nerve root compression on MRI **.**

2) Age group between minimum age of 15 and maximum of 75 years.

3) Patients with failed conservative line of management for the lumbar disc disease after 3 weeks.

4) Patients able to read and understand the nature of the study and give informed consent. Illiterate patients were explained in their own language.

EXCLUSION CRITERIA

- ❖ Failed back syndrome .
- ❖ Double level disc prolapse.
- ❖ Spinal Canal Stenosis .
- ❖ Secondary metastasis to spine .
- ❖ Associated with other pathological conditions.
- ❖ Cauda equina syndrome.
- ❖ Patients with foot drop and progressive neurological deficits.

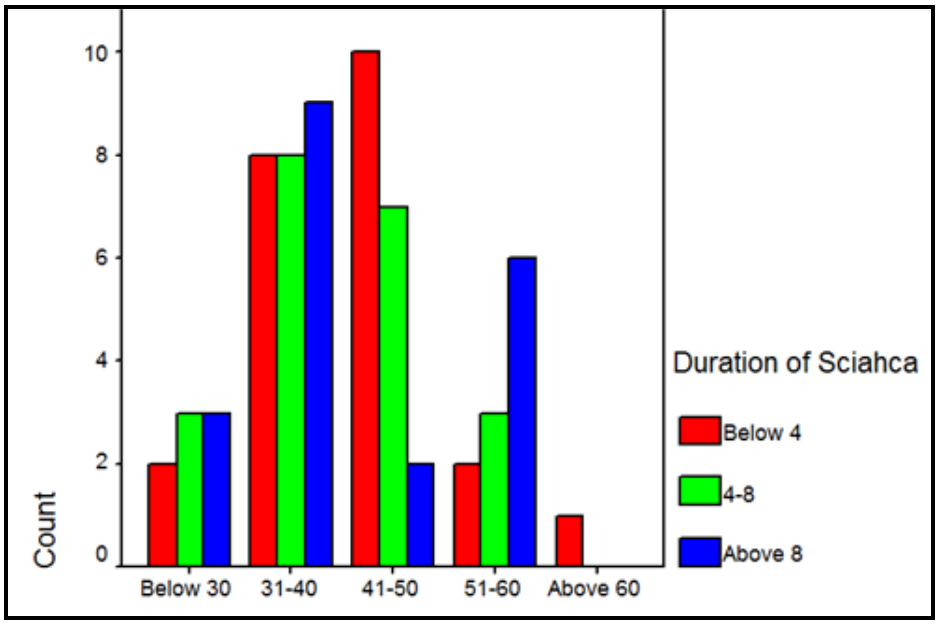
RESULTS AND ANALYSIS

A total of 64 Patients were included in study and divided into 3 sub cohorts based on duration of symptoms of sciatica, and out of which 23 Patients were in sub cohort A with duration of sciatica less than 4 months, and 21 in sub cohort B with duration of sciatica between 4 months- 8 months, and 20 in sub cohort C with duration of sciatica more than 8 months. They were assessed with JOABPEQ questionnaire at 6 months and one year and analysed.

Table 3:Age wise distribution of patients in each subcohort

Age In years	Sub Cohort A	Sub Cohort B	Sub Cohort C	Total	P value
Below 30	2	3	3	8	0.29
31-40	8	8	9	25	
41-50	10	7	2	19	
51-60	2	3	6	11	
More than 60	1	0	0	1	
Total	23	21	20	64	

Figure 25:Graph showing age wise distribution in each sub cohort

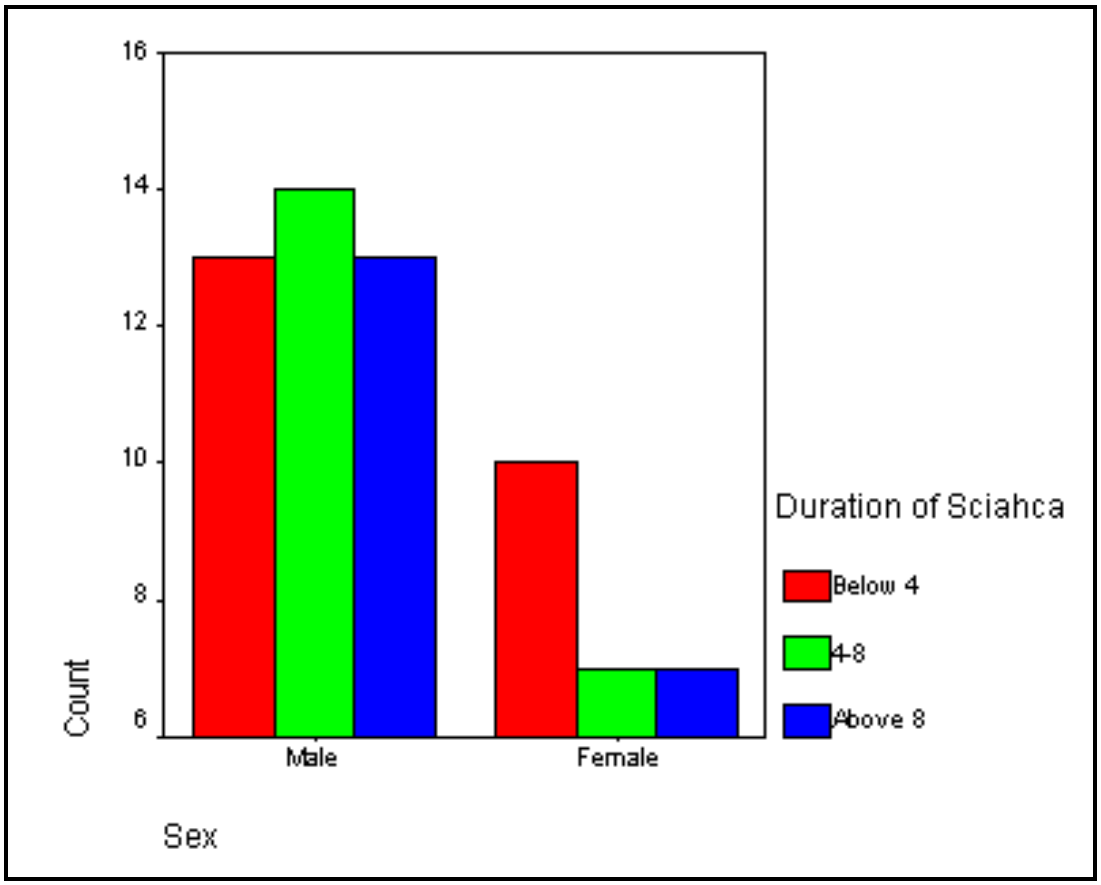


COMMENTS: Majority of Patients are between 30 to 50 years. Majority of Patients in sub cohort A are in between 40 to 50 years(43%).Majority of Patients in Sub cohort B and Sub cohort C fall in the age group between 30 to 50 years(38%&42% respectively). Since the P value is not significant, age does not play a role in this outcome.

TABLE 4:Table showing sex distribution

Subcohort	N	Percentage of males	Percentage of females
A	23	56.5%	43.5%
B	21	66.7%	33.3%
C	20	65%	35%

FIG 26:Graph showing sex distribution in each sub cohort



COMMENTS: Percentage of males is more in Sub cohort B. Percentage of females is more in Sub cohort A. Since the P value is not significant, sex does not play any role this outcome.

Table 5:Table showing age versus sex in each cohort.

Age in years	**Subcohort A**		**Subcohort B**		**Subcohort C**	
Sex	M	F	M	F	M	F
Below 30	1	1	3	0	2	1
31-40	2	6	5	3	5	4
41-50	7	3	4	3	2	0
51-60	1	1	2	1	3	3
More than 60	1	0	0	0	0	0

TABLE 6: Frequency table showing type of occupation in each Sub cohort

Type of worker	**Sub cohort A**	**Sub cohort B**	**Sub cohort C**
Sedentary	47%	42%	40%
Moderate	26%	1%	25%
Heavy	26%	57%	35%

COMMENTS: Since the P value is not significant, it does not play any role in outcome.

Table 7: Frequency table showing involved side

Involved side	Sub Cohort A	Sub Cohort B	Sub Cohort C
Left	34%	66%	20%
Right	39%	33%	45%
Both	26%	1%	35%

Table 8: Comparison of sub cohorts with respect to presence of various clinical signs

Sub cohort	Para spinal spasm	Nerve tension signs	Sensory deficit	Motor deficit
A	98%	87%	17%	21%
B	99%	95%	57%	28%
C	60%	64%	45%	30%

COMMENTS: Para spinal muscle spasm, nerve tension signs are more common in sub cohort A and B and it is statistically significant. Deficits are more common in Sub cohort C.

Table 9: Frequency table for level of disc among the various cohorts.

Subcohort	N	Level of disc	Frequency	Percentage
A	23	L4-L5	16	69%
		L5-S1	7	30%
B	21	L4-L5	10	47%
		L5-S1	10	47%
C	20	L4-L5	11	55%
		L5-S1	9	45%

COMMENTS: L4-L5 disc is the most common level of disc involved amongst the study group. There was only one case of L3-L4 disc.

Figure 27: Graph showing the percentage of level of disc in the sub cohorts

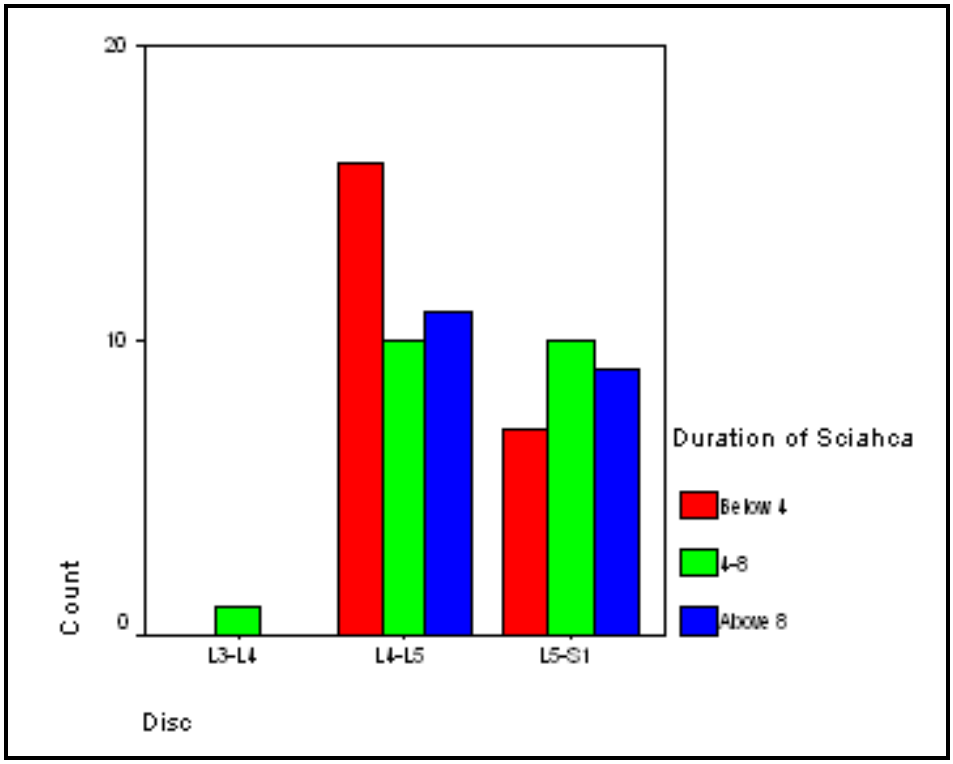


Table 10: Indication for surgery in each cohort

Indication for surgery	Sub Cohort A	Sub cohort B	Sub cohort C
Pain	18	4	5
Pain + Deficit	5	17	15

Comments: Pain is more common indication in sub cohort A, Whereas pain and deficits are more common in sub Cohort B&C.

Table 11:Table showing type of disc prolapse in each cohort

Type of disc prolapse	Sub Cohort A	Sub Cohort B	Sub Cohort C
Disc extrusion	14	9	9
Disc protrusion	9	12	11

Comments: Disc extrusion was more common in cohort A ,whereas disc protrusion was more common in cohort B&C.No disc bulges or disc sequestration cases in our study.

FIGURE 28: Graph showing type of disc prolapse

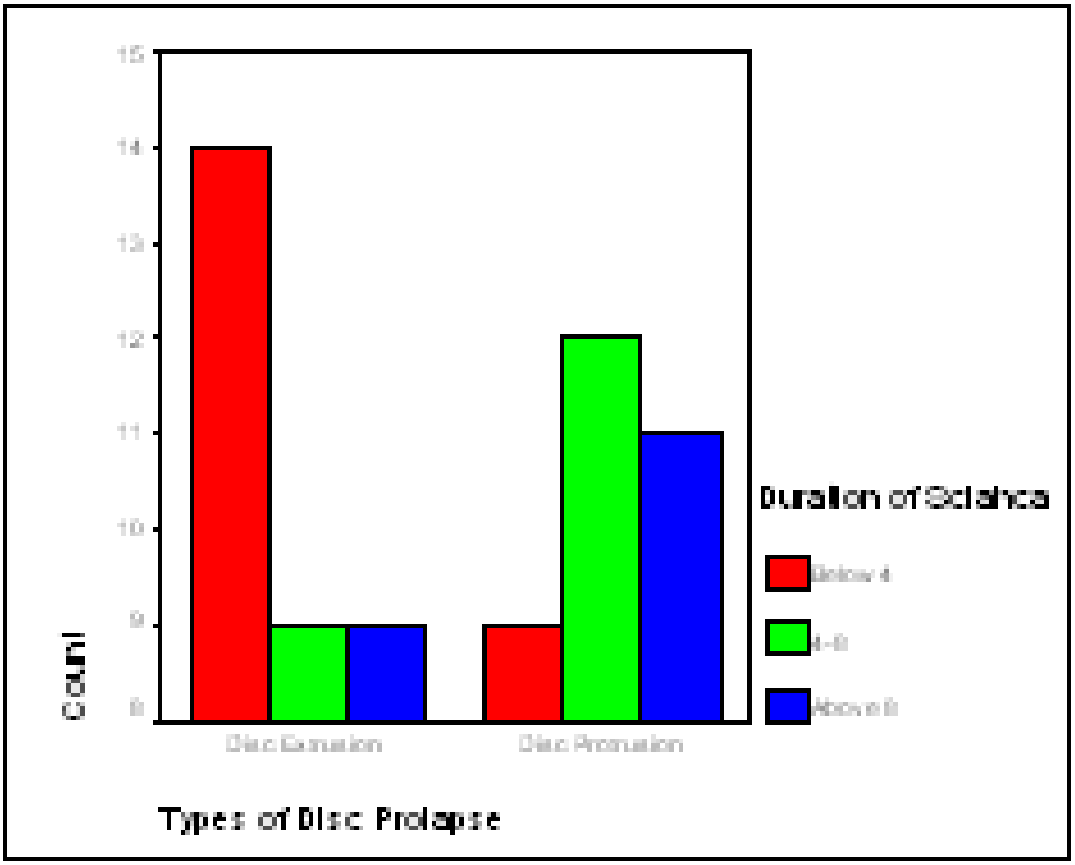


Table12:Mean of low back pain scores in each Sub cohort.

Sub Cohort type	N	Mean	P value
A	23	47.87	<0.01
B	21	52.00	
C	20	22.95	
Total	64	41.44	

Comments: Sub Cohort B (4-8 months) has high mean value compared to Sub Cohort A & SubCohort C.The P value is highly significant. Hence Patients with pre-operative duration of sciatica between 4 to 8 months have greater improvements in the low back pain scores.

Table 13:Mean of lumbar function scores in each Sub cohort

Sub Cohort type	N	Mean	P value
A	23	45.52	<0.01
B	21	54.62	
C	20	20.05	
Total	64	40.55	

Comments: Cohort B has more mean value than cohort A &C. Hence Patients with preoperative duration of sciatica between 4 to 8 months have greater improvements in the lumbar function scores. This finding is statistically significant.

Table 14: Mean of walking ability scores in each Sub cohort:

Sub Cohort type	N	Mean	P value
A	23	49.87	<0.01
B	21	56.81	
C	20	19.45	
Total	64	42.64	

Comments: Cohort B has high mean value compared to cohort A &C. It is statistically significant. Hence Patients with preoperative duration of sciatica between 4 to 8 months have greater improvements in the walking ability scores.

Table 15:Mean value of the social life functions in each Sub cohort:

Sub Cohort type	N	Mean	P value
A	23	39.22	<0.01
B	21	43.48	
C	20	21.00	
Total	64	34.92	

Comments: Sub Cohort B has high mean value compared to cohort A &C .It is statistically significant .Hence Patients with pre-operative duration of sciatica between 4 to 8 months have greater improvements in the social life function.

Table16:Mean of mental health scores among each Sub cohort:

Sub Cohort type	N	Mean	P value
A	23	33.59	0.029
B	21	32.52	
C	20	22.95	
Total	64	29.86	

Comments: Sub Cohort A has high mean value compared to other cohorts .It is significant statistically. Hence Patients with pre-operative duration of sciatica of less than 4 months have greater improvements in the mental health scores.

Table 17:Mean value of the duration of hospital stay in each cohort:

Type of cohort	N	Mean in days	P value
A	23	7.43	<0.01
B	21	7.90	
C	20	10.60	
Total	64	8.58	

Comments: The mean duration of hospital stay is more in Sub cohort C than other Sub cohorts, which is significant statistically.

Table 18: Frequency table for post-operative complications of surgery among the various sub cohorts.

Type of Sub cohort	N	No of complications	Percentage of complications	P value
A	23	1	4.3%	0.05
B	21	1	4.3%	
C	20	4	25%	

Comments: Complication rate was more in Sub cohort C. It is statistically less significant. 2 Patients in cohort A&B and 1 patient in Sub cohort C developed superficial wound infection on day 5, for which debridement was done. 3 patients in group C developed grade1 instability at the operated level at one year follow up.

DISCUSSION

Our prospective study has clearly shown that preoperative duration of sciatica has an effect on the outcome of surgery. We have arrived at a statistically significant result that patients with preoperative duration of sciatica more than 8 months have poor outcome using JOABPEQ. Patients with preoperative duration of sciatica between 4 to 8 months have better improvement in low back pain scores, lumbar function scores, walking ability ,social life function except the mental health scores, which is better in patients with preoperative duration of sciatica less than 4 months. So the upper limit of the golden period is 8 months. Operating within 4 months of onset of pain gives pain relief and hence less morbidity and better mental health scores only. So conservative management can be carried up to 4 months. Between 4 to 8 months, surgery has to be considered as early .Taking the mean of all values of preoperative sciatica of all patients between 4 to 8 months, we conclude 6 months to be ideal duration up to which we can wait, but not more than 8 months. With regards to type of disc prolapse, patients with preoperative duration of sciatica less than 8 months with disc extrusion have a significant improvement in the low back

pain and mental health scores. More than 8 months irrespective of the type of disc prolapse outcome is poor.

Herniation of nucleus pulposus in lumbar spine causes sciatica, the duration of which ranges from days to years. Initially conservative treatment is followed with the hope that pain subsides due to resorption of herniated disc as shown by the MRI studies. It is not clear when surgery should be considered if the pain does not respond. The presence of noxious stimuli like the herniated disc for long time leads to sensitization of the neurons in the dorsal horn of the spinal cord and other areas of the somatosensory pathway. This leads to increased spontaneous activity, reduced threshold or increased responsivity to afferent inputs, prolonged after discharges to repeated stimulation and expansion of the peripheral receptive field of dorsal horn neurons. Clinical neurosurgery studies reveal that thalamus of the Patients with neuropathic pain display abnormal bursting activity. Hence, prolonged persistence of the noxious stimuli leads to above changes and the pain persists even after the removal of the stimulus[48].

The studies of Jancalek et al in rat spines, showed that if the nerve root is compressed for more than 5 weeks, regenerative effects on decompression was less, and hence they recommended

early surgical decompression after 2-3 months of conservative treatment to prevent irreversible morphological changes in the nerve root[48].

In a prospective study by Ng et al of 113 patients, they concluded that duration of sciatica of more than 12 months had a poor outcome .Our study cannot be compared with it, as they have used different outcome measures and statistical analysis[48].

In a similar study by Akagi et al, who used JOABPEQ showed no difference in outcome between the early(<3 months) and late(>3months) groups except for mental health scores which was better in late group. But his study consisted of only 42 patients and his follow up was for only 6 months. Our study consists of 64 patients and follow up is for 1 year. Differences in the race and standard of living of people may also be the cause for this which needs to be further studied .[28]

In a prospective study of 132 Patients who underwent surgery for lumbar disc herniation, the Nygaard et at evaluated the prognostic value of different variables in the duration of symptoms for the 1-year period after surgery.

Analysis of these results indicates that leg pain lasting more than 8 months correlates with an unfavorable postoperative outcome[48].

In the prospective study of 171 Patients undergoing lumbar discectomy by Silverpat et al, showed that duration of leg pain lasting for less than 6 months were related to good/excellent results outcome at 2-year and good/excellent subjective results at the long-term follow-up[48].

In a prospective study by Hurme et al on 357 Patients concluded that the duration of sciatica of more than 2 months was associated with poor prognosis. But this study was a short term study (6 months) and they have used different outcome measure tools. The social and psychological factors had more influence on the outcome than the preoperative physical examination[48].

In a prospective study by Quigley of 374 Patients undergoing unilateral single level microdisccectomies found that length of symptoms more than 6 months affect outcome, but this study was a short term study (6 months) [48].

In a prospective consecutive study by Rothoerl el al of 219 Patients undergoing primary conventional discectomy for monosegmental herniation of nucleus pulposus in lumbar spine they

found a statistically significant worst outcome in patients suffering from leg pain of more than 2 months duration. In this study they used a Prolo scale to measure the outcome[48].

Our study has also showed that complications are more in Patients with duration of sciatica more than 8 months. Most Patients developed instability(15%) at the operated level at one year follow up. A few Patients in our study had developed stiffness of the back. They had reduced flexion movements at the lumbar spine at 1 year follow up due to delay in the start of the physiotherapy and apprehension by the Patients, that early start of physiotherapy may lead to recurrence of symptoms. Hence we recommend physiotherapy to strengthen back muscles to be initiated by 3 months post operative period.

Patients with more than 8 months duration of sciatica had still persistence of pain ,lesser degree than before surgery in the post-operative period. Hence the duration of the hospital stay is more in this Sub cohort.

Hence from the review of literature it could be definitely said that conservative management can be instituted up to 2 months as the symptoms might resolve and while , surgery performed after 12

months almost always leads to poorer outcome with patients suffering from chronic neuropathic pain and sensory disturbances in spite of removal of painful stimulus[48]. From our study we have come to conclusion that conservative management can be instituted in patients up to 4 months of sciatica as they show less improvement in JOABPEQ scores .The surgical outcome in patients with sciatica of more than 8 months is poor as they show very less improvement in JOABPEQ scores. Patients with sciatica between 4 to 8 months, show more improvements in JOABPEQ scores than the other two groups. Hence surgery can be considered between 4 to 8 months.We have taken the mean value of duration of sciatica of all patients in subcohort B and arrived at a result ,that surgery can be considered at 6 months.

So finally due to conflicting results of the literature, we advise shared decision making between the Patient and the surgeon. Explain the patient regarding the advantages of operating early and late and then proceed.

CONCLUSION

The duration of sciatica has a significant predictive value in the functional outcome following Fenestration discectomy. As the duration of sciatica increases, the functional outcome following surgery is poor.

From our study, we have shown that preoperative duration of sciatica more than 8 months is associated with poor outcome. Conservative management can be instituted up to 4 months of sciatica. In patients with more than 8 months of preoperative duration of sciatica, irrespective of the type of disc prolapse the outcome is poor.

The most common level of disc prolapse noted in our study was that of the L4-L5 with equitable distribution across all the cohorts.

Ultimately, shared decision making between the Surgeon and Patient after taking into due consideration the advantages, disadvantages and complications of surgery, and on instituting appropriate physiotherapy, a good outcome can be obtained.

SUMMARY

Sixty four patients with lumbar Intervertebral disc prolapse divided into 3 sub cohorts accordingly to the duration of sciatica. All these 64 patients were analysed clinically and the diagnosis confirmed with MRI and underwent Fenestration discectomy. They were scored with JOABPEQ preoperatively and postoperatively at 6^{th} months and at 1 year follow up.

Patients with preoperative duration of sciatica between 4 to 8months showed better improvement than those less than 4 months. More than 8 months had worst prognosis.

There is risk of complication which has to be emphasized while selecting the patient for Fenestration discectomy.

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JOA BACK PAIN EVALUATION QUESTIONNAIRE

With regard to your health condition during the last week, please circle the number of the one answer that best applies for each of the following questions. If your condition varies depending on the day or the time, circle the number of the answer that applies when your condition was at its worst.

LOW BACK PAIN QUESTIONS

Q1-1 To alleviate low back pain, you often change your posture.

1) Yes 2) No

Q1-2 Because of the low back pain, you lie down more often than usual.

1) Yes 2) No

Q1-3 Your lower back is almost always aching.

1) Yes 2) No

Q1-4 Because of the low back pain, you cannot sleep well. (If you take sleeping pills because of the pain, select “No.”)

1) No 2) Yes

LUMBAR FUNCTION QUESTIONS

Q2-1 Because of the low back pain, you sometimes ask someone to help you when you do something.

1) Yes 2) No

Q2-2 Because of the low back pain, you refrain from bending forward or kneeling down.

1) Yes 2) No

Q2-3 Because of the low back pain, you have difficulty standing up from a chair.

1) Yes 2) No

Q2-4 Because of the low back pain, turning over in bed is difficult.

1) Yes 2) No

Q2-5 Because of the low back pain, you have difficulty putting on foot wears.(For local population this questionaire was modified as any difficulty in praying / cleaning of floor)

1) Yes 2) No

Q2-6 Do you have difficulty with any one of the following motions; bending forward, kneeling or stooping?

1) I have great difficulty

2) I have some difficulty

3) I have no difficulty

WALKING ABILITY QUESTIONS

Q3-1 Because of the low back pain, you walk only short distances.

1) Yes 2) No

Q3-2 Because of the low back pain, you stay seated most of the day.

1) Yes 2) No

Q3-3 Because of the low back pain, you go up the stairs more slowly than usual.

1) Yes 2) No

Q3-4 Do you have difficulty going up the stairs?

1) I have great difficulty

2) I have some difficulty

3) I have no difficulty

Q3-5 Do you have difficulty walking more than 15 minutes?

1) I have great difficulty

2) I have some difficulty

3) I have no difficulty

SOCIAL LIFE QUESTIONS

Q4-1 Because of the low back pain, you do not do any routine housework these days.

1) No 2) Yes

Q4-2 Have you been unable to do your work or ordinary activities as well as you would like?

1) I have not been able to do them at all.

2) I have been unable to do them most of the time.

3) I have sometimes been unable to do them.

4) I have been able to do them most of the time.

5) I have always been able to do them.

Q4-3 Has your work routine been hindered because of the pain?

1) Greatly 2) Moderately 3) Slightly (somewhat)

4) Little (minimally) 5) Not at all

MENTAL HEALTH QUESTIONS

Q5-1 Because of the low back pain, you get irritated or get angry at other persons more often than usual.

1) Yes 2) No

Q5-2 How is your present health condition?

1) Poor 2) Fair 3) Good 4) Very good 5) Excellent

Q5-3 Have you been discouraged and depressed?

1) Always 2) Frequently 3) Sometimes 4) Rarely 5) Never

Q5-4 Do you feel exhausted?

1) Always 2) Frequently 3) Sometimes 4) Rarely 5) Never

Q5-5 Have you felt happy? 1) Never 2) Rarely 3) Sometimes 4) Almost always 5) Always

Q5-6 Do you think you are in decent health?

1) Not at all (my health is very poor)

2) Barely (my health is poor)

3) Not very much (my health is average health)

4) Fairly (my health is better than average)

5) Yes (I am healthy)

Q5-7 Do you feel your health will get worse?

1) Very much so 2) A little bit at a time

3) Sometimes yes and sometimes no

LIST OF ABBREVIATIONS USED

CT	:	Computed tomography
IVDP	:	Inter- vertebral disc prolapse
IFT	:	Interferential Therapy
MRI	:	Magnetic resonance imaging
LS	:	Lumbo-Sacral
JOABPEQ	:	Japanese Orthopaedic Association Back Pain Evaluation Questionnaire
SWD	:	Short Wave Diathermy
TENS	:	Transcutaneous Electric Nerve Stimulation

LIST OF TABLES

1) Average recommended trial of failed non-surgical treatment

2) Table showing the neurological findings in compression of the corresponding nerve roots

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10) Table showing type of disc prolapse

11) Table showing mean of low back pain scores in each sub cohort

12) Table showing mean of lumbar function scores in each cohort.

13) Table showing mean of walking ability in each sub cohort.

14) Table showing mean of social life functions in each cohort.

15) Table showing mean of the mental health scores in each cohort.

16) Mean duration of hospital stay.

17) Table showing the post-operative complications

Less Than 4 Months

S.No	Name	Ip no	Sex/ Age	Occupation	Duration of Pre-Op Pain	Presenting Complaint	Duration of Sciahca	Involved Side	Para Muscle SPasm	Nerve Tension	Secondary Deficit
1	Krishnan	79938	62/M	Shop Keeper	2 Month	Pain	2 Months	L	+	Y	N
2	Prakash	756424	33/m	Tiles Work	1 Month	Pain	1 Month	L	+	Y	N
3	Elumalai	11984	45/M	Cooly	3 Months	Pain	3 Months	R	+	Y	Y
4	Punitha	22613	40/F	H.W	3 Months	Pain	3 Months	Both	+	Y	N
5	Shanthi	61453	45/F	H.W	4 Months	Pain	4 Months	Both	+	Y	N
6	Hasena Banu	124783	d35/F	H.W	2 Month	Pain	2 Months	L	+	Y	N
7	Muthukumar	61253	29/M	Driver	1 Month	Pain	1 Month	L	+	Y	Y
8	Malliga	93044	US/F	HW	3 Months	Pain	3 Months	Both	+	Y	N
9	Punitha	16122	45/F	HW	4 Months	Pain	4 Months	Both	+	Y	N
10	Sakuntala	50824	40/F	HW	3 Months	Pain	3 Months	Both	+	Y	N
11	Kala	53840	35/F	HW	2 Month	Pain	2 Months	L	+	Y	N
12	Renuka	93324	44/F	HW	3 Months	Pain	3 Months	R	+	N	N
13	Selvaraj	20557	41/M	Coolie	2 Months	Pain	2 Months	R	+	Y	N
14	Tamilselvan	93036	46/M	Cooly	3 Months	Pain	3 Months	R	+	Y	N
15	Lilly	14566	55/M	HW	4 Months	Pain	4 Months	R	+	Y	n
16	Sujatha	56788	20/F	Student	3 Months	Pain	3 Months	R	+	Y	N
17	Ayyappan	13439	45/M	Lorry Driver	3 Months	Pain	3 Months	R	+	Y	N
18	Shanmugam	16163	45/M	Business	2 Months	Pain	2 Months	B/L	+	Y	Y
19	Deivendran	15678	39/M	Cooly	3 Months	Pain	3 Months	R	+	Y	N
20	Rajendran	14892	48/M	Cooly	4 Months	Pain	4 Months	L	+	Y	N
21	Murugan	38994	45/M	Cooly	2 Months	Pain	2 Months	R	+	Y	Y
22	Ganesan	160798	56/M	cooly	3 Months	Pain	3 Months	R	+	Y	Y
23	Amuthavalli	3435	35/F	house wife	1 Month	Pain	1 Month	L	+	Y	Y

Less Than 4 Months

Motor Deficit	Disc	Indicate of Surgery	Level of Surgery	Procedure done	Duration of Hospital Stay	Complication	LBP	Lumbar Function	Walking Ability	Social Life Function	Mental Health	Types of Disc Prolapse
Y	L4-L5	Pain deficit	L4-L5	Laminectomy, Fd	12 Days	N	28	33	43	27	-	Disc protrusion
N	L5-S1	Pain	L5-S1	FD	5 Days	N	43	84	71	19	53	Disc Extrusion
N	L5-S1	Pain	L5-S1	FD	9 Days	N	86	67	71	54	39	Disc Extrusion
Y	L4-L5	Pain	L4-L5	F.D	6 Days	N	0	34	29	14	12	Disc protrusion
N	L4-L5	Pain	L4-L5	F.D	8 Days	Y	43	33	-14	0	12	Disc protrusion
N	L4-L5	Pain	L4-L5	F.D	5 Days	N	72	33	93	67	27	Disc protrusion
N	L4-L5	Pain deficit	L4-L5	F.D	5 Days	N	29	50	79	65	33	Disc Extrusion
Y	L4-L5	Pain deficit	L4-L5	F.D	3 Days	N	-14	17	0	13	12	Disc protrusion
N	L4-L5	Pain	L4-L5	F.D	8 Days	N	43	33	20	14	22	Disc protrusion
Y	L4-L5	Pain deficit	L4-L5	F.D	3 Days	N	86	67	71	54	39	Disc Extrusion
N	L4-L5	Pain	L4-L5	F.D	5 Days	N	71	100	71	38	54	Disc Extrusion
N	L4-L5	Pain	L4-L5	F.D	8 Days	N	44	24	34	62	24	Disc Extrusion
N	L5-S1	Pain	L5-S1	F.D	10 Days	N	43	67	79	60	37	Disc protrusion
N	L5-S1	Pain	L5-S1	F.D	5 Days	N	86	66	72	53	38	Disc Extrusion
n	L4-L5	Pain	L4-L5	F.D	11 Days	N	43	50	36	48	42	Disc Extrusion
N	L4-L5	Pain	L4-L5	F.D	7 Days	N	15	25	7	18	33	Disc Extrusion
N	L5-S1	Pain	L5-S1	F.D	7 Days	N	64	44	72	77	37	Disc Extrusion
Y	L4-L5	Pain	L4-L5	F.D	10 Days	N	57	82	79	44	39	Disc Extrusion
N	L4-L5	Pain	L4-L5	F.D	7 Days	N	86	67	72	56	41	Disc Extrusion
N	L5-S1	Pain	L5-S1	F.D	8 Days	N	46	36	24	17	22	Disc protrusion
N	L4-L5	Pain	L4-L5	F.D	9 Days	N	30	35	45	29	22	Disc protrusion
N	L4-L5	Pain deficit	L4-L5	F.D	10 Days	N	43	17	22	27	27	Disc Extrusion
N	L5-S1	Pain	L5-S1	F.D	10 Days	N	57	-17	71	46	74	Disc Extrusion

More Than 8 Months

S.No	Name	Ip	Sex/ Age	Occupation	Duration of Pre-Op Pain	Presenting Complaint	Duration of Sciahca	Involved Side	Para Muscle SPasm	Nerve Tension	Secondary Deficit
1	Saraswathi	93074	36/F	Tailor	3 Years	Pain	3 Years	R	+	Y	Y
2	Krishnamurthy	8539	26/M	Driver	1 Year	Pain	1 Year	R	+	Y	N
3	Kuppammal	13244	55/F	HW	1 Year	Pain	1 Year	L	+	Y	N
4	Paunammal	75246	55/F	HW	3 Years	Pain	3 Years	R	+	Y	Y
5	Manjula	45533	39/F	HW	1 year	Pain	1 year	R	+	Y	N
6	Kodandan	64176	50/M	Tailor	2 years	Pain	2 years	L	+	N	N
7	Radhika	23021	26/F	HW	1.5 Years	Pain	1.5 Years	R	+	Y	N
8	Maharani	90148	52/F	HW	1.5 Years	Pain	1.5 Years	L	+	Y	N
9	Vinotha	11780	36/F	HW	3 Years	Pain	3 Years	R	+	Y	Y
10	Venkateshwaran	6740	53/M	RE	2 Years	Pain	2 Years	R	+	Y	N
11	Saisa	13240	28	Driver	1 Year	Pain	1 Year	R	+	Y	N
12	Babu	92894	40/M	Coolie	1 year	Pain	1 year	B/L	+	Y	Y
13	Shanmugam	42945	45/M	Coolie	3 Years	Pain	3 Years	B/L	-	Y	Y
14	Ashok	13055	35/M	Tech	10 Months	Pain	10 Months	B/L	-	Y	Y
15	Deepak	16778	37/M	Tech	10 Months	Pain	10 Months	B/L	-	Y	N
16	Mani	84775	53/M	Coolie	1 Year	Pain	1 Year	B/l	-	-	Y
17	Paramanandan	92783	60/M	Coolie	2 Years	Pain	2 Years	B/L	-	Y	N
18	Pencilliah	58764	37/M	Coolie	9 Months	Pain	9 Months	B/L	-	Y	Y
19	Pitchaikani	85407	40/M	Coolie	1.5 Years	Pain	1.5 Years	R	-	Y	N
20	Arunachalam	86445	37/M	Coolie	1 Year	Pain	1 Year	L	-	Y	Y

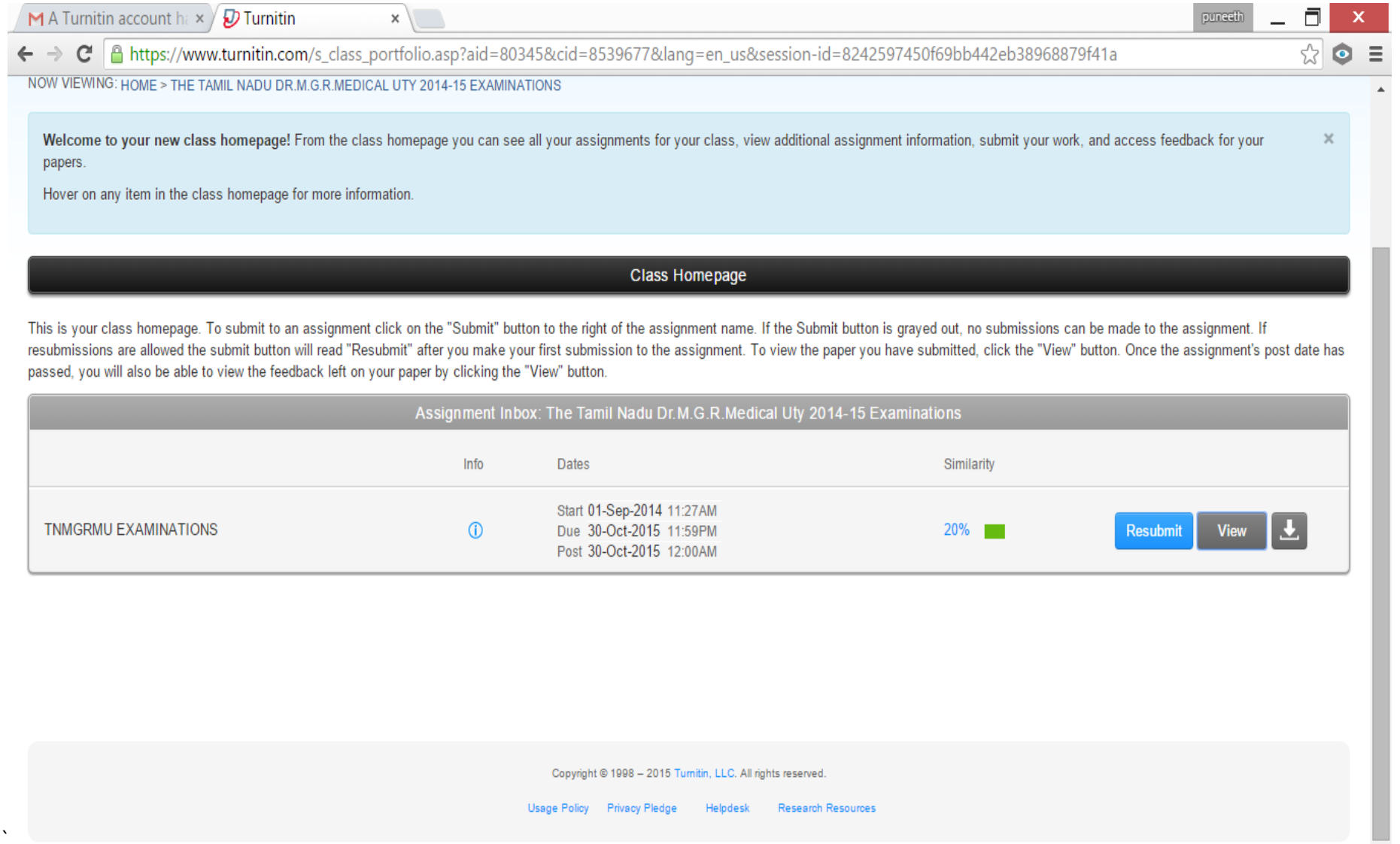
More Than 8 Months

Motor Deficit	Disc	Indicate of Surgery	Level of Surgery	Procedure done	Duration of Hospital Stay	Complication	LBP	Lumbar Function	Walking Ability	Social Life Function	Mental Health	Types of Disc Prolapse
N	L4-L5	Pain Deficit	L4-L5	F.D	10 Days	N	29	-8	36	24	6	Disc Extrusion
N	L5-S1	Pain Deficit	L5-S1	F.D	7 Days	N	29	25	71	32	36	Disc Protrusion
Y	L4-L5	Pain Deficit	L4-L5	FD	10 Days	N	-14	17	0	13	12	Disc Protrusion
N	L4-L5	Pain Deficit	L4-L5	FD	10 Days	N	-17	19	14	19	20	Disc Extrusion
N	L5-S1	Pain	L5-S1	FD	10 Days	Y	15	0	0	40	15	Disc Protrusion
N	L4-L5	Pain	L4-L5	FD	6 Days	N	14	9	-22	3	10	Disc Protrusion
N	L5-S1	Pain	L5-S1	FD	15 Days	Y	29	17	7	8	30	Disc Extrusion
N	L4-L5	Pain Deficit	L4-L5	FD	10 Days	Y	43	100	50	54	45	Disc Protrusion
N	L4-L5	Pain Deficit	L4-L5	FD	10 Days	N	29	-8	34	22	6	Disc Extrusion
N	L5-S1	Pain	L5-S1	FD	6 Days	N	29	40	21	44	42	Disc Extrusion
N	L5-S1	Pain	L5-S1	FD	7 Days	N	29	25	32	22	31	Disc Extrusion
Y	L4-L5	Pain Deficit	L4-L5	FD	13 Days	N	15	17	29	-8	9	Disc Protrusion
Y	L4-L5	Pain Deficit	L4-L5	FD	10 Days	N	31	19	-22	-7	12	Disc Extrusion
N	L5-S1	Pain Deficit	L5-S1	FD	10 Days	N	24	21	-14	15	14	Disc Protrusion
Y	L4-L5	Pain Deficit	L4-L5	FD	12 Days	N	26	22	-15	17	18	Disc Extrusion
N	L5-S1	Pain Deficit	L5-S1	FD	13 Days	N	34	14	44	19	20	Disc Protrusion
Y	L4-L5	Pain Deficit	L4-L5	FD	14 Days	Y	32	16	42	21	31	Disc Protrusion
N	L5-S1	Pain Deficit	L5-S1	FD	16 Days	Y	28	17	34	24	32	Disc Extrusion
Y	L4-L5	Pain Deficit	L4-L5	FD	12 Days	N	42	28	32	26	34	Disc Protrusion
N	L5-S1	Pain Deficit	L5-S1	FD	11 Days	N	12	11	16	32	36	Disc Protrusion

Patients with duration of symptoms 4 to 8 months

Sl	Name/Ip no	Age/sex	0ccupation	Duration Of pre op pain	Presenting complaint	Duration Of sciatica	side	Para Spina spasm	NERVE TENSION SIGNAS	SENSORY DEFICIT	MOTOR DEFICIT	LEVEL OF DISC	INDICATION FOR SURGERY	LEVEL OF SUR	P/D	HOSP STAY	COMPLICATION
1	MANJULA/45661	38/F,	HOUSEWIFE	6 MONTH	PAIN	6 MONTHS	L	+	+	+	-	L5-S1	P,D	L5-S1	FENESTRATION DISCECTOMY	5 DAYS	N
2	DHANASEKAR/48348	24/M,	AGRICULTURE	5 MONTHS	PAIN	5 MONTHS	L	+	+	-	-	L4-L5	P	L4-L5	FENESTRATION DISCECTOMY	9	N
3	SUGITH RAJ/54303	40/M	WELDER	6MONTHS	PAIN	6 MONTHS	L	+	+	-	+	L4-L5	P,D	L4-L5	FENESTRATION DISCECTOMY	5	N
4	PERUMAL/128026	60/M,	WEAVER	7 MONTHS	PAIN	7 MONTHS	R	+	+	-	-	L5-S1	P	L5-S1	FENESTRATION DISCECTOMY	7	N
5	GEETHA/23691	43/F	HOUSE WIFE	8 MONTHS	PAIN	8 MONTHS	R	+	-	-	+	L4-L5	P,D	L4-L5	FENESTRATION DISCECTOMY	7	N
6	KHADEEN BEE/77232	60/F,	HOUSEWIFE	6 MONTHS	PAIN	6 MONTHS	L	+	+	+	+	L4-L5	P,D	L4-L5	FENESTRATION DISCECTOMY	10	Y
7	TAMIL SELV/5916	46/F	HOUSEWIFE	6 MONTHS	PAIN	6 MONTHS	L	+	+	+	-	L5-S1	P,D	L5-S1	FENESTRATION DISCECTOMY	5	N
8	SAKTHIVEL/118773	37/F	AGRICULTURE	5 MONTHS	PAIN	5 MONTHS	L	+	+	-	-	L4-L5	P	L4-L5	FENESTRATION DISCECTOMY	9	N
9	USHA/18231	35/F	HOUSEWIFE	7 MONTHS	PAIN	7 MONTHS	L	+	+	-	-	L5-S1	P	L5-S1	FENESTRATION DISCECTOMY	7	N
10	KANAGA/89446	45/F	HOUSEWIFE	8 MONTHS	PAIN	8 MONTHS	L	+	+	+	+	L5-S1	P,D	L5-S1	FENESTRATION DISCECTOMY	9	N
11	MANOHARAN/113645	49/M	COOLY	6 MONTHS	PAIN	6 MONTHS	L	+	+	-	-	L3-L4	P,D	L3-L4	FENESTRATION DISCECTOMY	7	N
12	RAJAN/108186	44/M	WELDER	6 MONTHS	PAIN	6 MONTHS	L	+	+	-	+	L4-L5	P,D	L4-L5	FENESTRATION DISCECTOMY	5	N
13	HABIBREHMAN/64350	42/M	VENDOR	5 MONTHS	PAIN	5 MONTHS	L	+	+	-	-	L5-S1	P,D	L5-S1	FENESTRATION DISCECTOMY	6	N
14	JITHU(private)	36/M	TECHIE	6 MONTHS	PAIN	6 MONTHS	R	+	+	+	+	L4-L5	P,D	L4-L5	FENESTRATION DISCECTOMY	7	N
15	SANDEEP(private)	38/M	TECHIE	7 MONTHS	PAIN	7 MONTHS	R	+	+	+	-	L5-S1	P,D	L5-S1	FENESTRATION DISCECTOMY	8	N
16	CHELLAMUTHU/98178	48/M	COOLIE	5 MONTHS	PAIN	5 MONTHS	R	+	+	+	-	L4-L5	P,D	L4-L5	FENESTRATION DISCECTOMY	10	N
17	SHANKAR/82397	30/M	COOLIE	8 MONTHS	PAIN	8 MONTHS	L	+	+	+	-	L5-S1	P,D	L5-S1	FENESTRATION DISCECTOMY	10	N
18	MURALI/80013	24/M	COOLIE	6 MONTHS	PAIN	6 MONTHS	R	+	+	+	-	L4-L5	P,D	L4-L5	FENESTRATION DISCECTOMY	10	N
19	KASI/79986	35/M	COOLIE	5 MONTHS	PAIN	5 MONTHS	L	+	+	+	-	L5-S1	P,D	L5-S1	FENESTRATION DISCECTOMY	10	N
20	RANJITH(58542	35/M	COOLIE	7 MONTHS	PAIN	7 MONTHS	R	+	+	+	-	L4-L5	P,D	L4-L5	FENESTRATION DISCECTOMY	10	N
21	GAJENDRAN/16147	52/M	COOLIE	6 MONTHS	PAIN	6 MONTHS	L	+	+	+	-	L5-S1	P,D	L5-S1	FENESTRATION DISCECTOMY	10	N

S.NO	LBP	LUMBAR FUNCTION	WALKING ABILITY	SOCIAL LIFE/FUNCTION	MENTAL HEALTH	TYPE OF DISC PROLAPSE
1	72	50	64	38	40	DISC PROTRUSION
2	14	9	-22	3	10	DISC PROTRUSION
3	72	75	71	54	39	DISC PROTRUSION
4	72	75	93	46	37	DISC EXTRUSION
5	43	100	50	54	45	DISC PROTRUSION
6	72	50	64	38	40	DISC PROTRUSION
7	29	-8	36	24	6	DISC EXTRUSION
8	86	67	71	54	39	DISC PROTRUSION
9	22	34	52	14	12	DISC EXTRUSION
10	54	34	24	64	28	DISC EXTRUSION
11	72	100	100	73	52	DISC PROTRUSION
12	71	73	69	52	32	DISC PROTRUSION
13	29	75	100	73	42	DISC EXTRUSION
14	29	30	42	45	40	DISC EXTRUSION
15	42	54	55	60	32	DISC EXTRUSION
16	16	11	20	5	12	DISC PROTRUSION
17	45	90	52	56	47	DISC PROTRUSION
18	74	54	66	40	42	DISC PROTRUSION
19	84	65	69	52	37	DISC PROTRUSION
20	24	36	48	16	14	DISC EXTRUSION
21	70	73	69	52	37	DISC EXTRUSION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CERTIFICATE OF APPROVAL

To
Dr. K.Puneeth,
Postgraduate M.S. (Orthopaedics),
Madras Medical College,
Chennai – 600 003.

Dear Dr. K.Puneeth,

The Institutional Ethics Committee has considered your request and approved your study titled **"Study of outcome of early versus delayed surgery in lumbar disc prolapse – A prospective study." No.43082014.**

The following members of Ethics Committee were present in the meeting held on 05.08.2014 conducted at Madras Medical College, Chennai-3.

1.	Dr.C.Rajendran, M.D.,	: Chairperson
2.	Dr.R.Vimala, M.D., Dean, MMC, Ch-3	: Deputy Chairperson
3.	Prof.B.Kalaiselvi, M.D., Vice-Principal, MMC, Ch-3	: Member Secretary
4.	Prof.R.Nandhini, M.D., Inst.of Pharmacology, MMC	: Member
5.	Dr.G.Muralidharan, Director Incharge, Inst.of Surgery	: Member
6.	Prof.K.Ramadevi, Director i/c, Inst.of Biochemistry, MMC	: Member
7.	Prof.Saraswathy, M.D., Director, Pathology, MMC, Ch-3	: Member
8.	Prof.Tito, M.D., Director i/c, Inst.of Internal Medicine, MMC	: Member
9.	Thiru S.Rameshkumar, Administrative Officer	: Lay Person
10.	Thiru S.Govindasamy, B.A., B.L.,	: Lawyer
11.	Tmt.Arnold Saulina, M.A., MSW.,	: Social Scientist

We approve the proposal to be conducted in its presented form.

The Institutional Ethics Committee expects to be informed about the progress of the study and SAE occurring in the course of the study, any changes in the protocol and patients information/informed consent and asks to be provided a copy of the final report.

11/8/14

Member Secretary, Ethics Committee

MEMBER SECRETARY
INSTITUTIONAL ETHICS COMMITTEE
MADRAS MEDICAL COLLEGE
CHENNAI-600 003